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The Prevention of Floods: an Irish River Case.

IT was found by an Irish Commission recently appointed to hold an inquiry respecting the drainage of the district traversed by the river Barrow and its tributaries that at the head of the river there is a watershed area of 408,000 acres, the water from which pours through a neck at Athy. If the watershed area were squared, it would be about twenty-five miles each way, north to south and east to west, and three-fourths of the area consist of table-land, the shallow depressions which the water-courses follow being separated by lands of low elevation and gentle undulations. On the river and its tributaries within this area are situated the towns of Athy at the southern border, Monasterevan and Portarlington near the centre, Kildare towards the north-east, Mountmellick on the west, Maryborough on the south-west, and Philipstown on the north-west, with other towns and places. Around and near to these, 22,000 acres of land are frequently covered with water to the average depth of a foot, and 23,000 acres around and beyond the flooded land are saturated up to the surface, although not covered with water. This water remains for many weeks together after a wet time, and even months, the condition of the river being such that the flood-waters run off very slowly. Here, as in England, flood-water standing upon land for a day or two,—a sufficient time to allow the silt which it holds in suspension to sink through it and be deposited on the land,—does no harm, it is rather a benefit to the land: but if it remains a long time it is very injurious in several respects; it kills the fine herbage and increases the growth of weeds and worthless grasses; it creates miasma; and Dr. MacCabe, the chief medical officer of the Irish Local Government Board, said that when the land is flooded or the subsoil waterlogged by recent floods, the solar heat which should be absorbed by the soil is wasted in evaporating the water, and from this evaporation result fogs along the valleys and a cloud-laden atmosphere, which favours a lowered condition of vital power; "one of the worst effects produced on the health of the inhabitants is that general lowering of the vital power always associated with the absence of sunlight. Where there is an absence of sunlight, a cloud-laden atmosphere, and fogs along the valleys, the whole surroundings are depressing, and the result is that the vital powers which all possess are unable to resist ordinary diseases." Dr. James Kilbride, of Athy, said: "A number of people are permanently lamed by rheumatism. They are young people, and they will never get better as long as they live in the locality. If the river were lowered the surrounding land could be made dry, and this part of the country would certainly become much more healthy than it is at present." In a flat district like this fogs extend laterally several miles from the river. It appeared, indeed, that the fogs could be seen from any point above them to extend like a lake, 15 ft. or 20 ft. deep, far away across the valleys.

In Athy, Monasterevan, Portarlington, and Mountmellick, the wells are sunk in the inhabited area through limestone drift or gravel. These being superficial wells, when the floods occur the level of the subsoil water is raised, and it flows into the wells and pollutes them, for, as there is no outlet for the drainage of the houses, the sewage is carried into the wells along with the flood-water.

Mr. Fitzgerald, who valued all the different tracts of land in the district for the Irish Board of Works, had examined the whole watershed area twenty years ago, and, on comparing the river and its tributaries now with what he found it to be then, he finds the channel has become narrower, that there are islands in its bed, and that the discharging power is less. Aquatic plants are growing, and the silt brought down by the floods clings to them, and the river channel is reduced in capacity. The people living there told him the floods were far larger within the last few years than ever they were before. The native grasses have died away, and are supplanted by coarse stuff. In estimating what the present value of the land is, and what it would be if the river were so managed as to prevent the land being flooded, Mr. Fitzgerald acted on the assumption that the submerged lands would be permanently relieved from floods, and that the adjoining land which is injured by being waterlogged, although not flooded on the surface, would be enabled to be drained to the depth of 4 ft. The area thus to be improved is 45,640 acres, the increased value of which would be 10,018*l.* a year.

The means to be adopted to effect the improvement of the district in the threefold respect mentioned, *i.e.*, the riddance of the fogs and miasma now arising from the ground, the lowering of the water level in the ground, so that the wells should not be affected, and the drainage of the land to the depth of 4 ft. for the improvement of agriculture, were stated by Mr. Manning, the Chief Engineer to the Irish Board of Works, to be to begin at Athy, the lowermost point of the drainage area, and to widen and deepen the river to the dimensions of 160 ft. bottom width, with side slopes, and at such levels as to produce a maximum depth of 9 ft. 6 in. of water, while the surface of the water would be low enough to afford an outlet for the drainage of the land into the river at all points. For sixteen miles, from Athy to Monasterevan, the inclination would be 15 in. per mile, and the discharging capacity of the river at Athy would be 400,000 cubic feet per minute, with a maximum mean velocity of 4 ft. per second.

The dimensions of the channel would be reduced as the work advances upwards, so that, combined with the increased inclination, the dimensions would be proportional to the quantity of water coming into the river at all points. This is estimated by Mr. Manning to be one cubic foot per minute per acre of the watershed area in the lower portion of the district, advancing to 3 cubic feet per minute per acre in the upper portion. These are founded on the following observations and calculations. The river Bann, at Toome, immediately below the immense reservoir of Lough Neagh, discharged during the flood of February, 1877, 682,000 cubic feet per minute from a catchment area of 1,193,600 acres, or 0·57 cubic feet per acre, the area of the lake being 100,000 acres. On that day the lake rose 4 in., which represented a discharge of 0·845 cubic feet per minute per acre of the catchment area, so that but for the interposition of the reservoir the discharge into the lower Bann would have been 1·417 cubic feet per minute per acre. But more numerous observations were made on the river Brosna, 20 miles to the westward of the Barrow, where the watershed area or catchment is 285,232 acres. Mr. Kane made observations extending over thirty years, from which it appears that the greatest rainfall in a year was 39·90 in., the least 14·42 in., and the mean 27·94. The greatest in twenty-four hours was 2·09 in., which occurred in June, 1877. At Ferbane, where the watershed area is 285,232 acres, the greatest observed discharge was 267,477 cubic feet per minute, being 0·932 cubic feet per minute per acre.

It must be said that the Commission had the advantage of having for one of its members Mr. Richard Hassard, C.E., who was able to elicit from the engineering witnesses much information which might not otherwise have been given, and Mr. Hassard asked Mr. Manning to give other instances. Accordingly he stated that on the Woodford river, a tributary of the Brosna, where the watershed

area is 101,455 acres, the flood discharge was 1·12 cubic feet per minute per acre. The upper Erne district is 309,000 acres, and the discharge 0·88 cubic feet per minute per acre. The rain basin or catchment area of another river, the Inny, is 231,116 acres, and the discharge 0·88. But here there are some lakes, which make a difference in the discharge when taken per minute. The Ballinamore and Balliconnell district, 90,000 acres, discharge 1·12. The Fergus district, county Clare, 104,960 acres, discharge 0·76. But here again there are lakes, and also swallow holes in the bed of the stream, so that this last is not a good example. The Boyne district, 304,139 acres, discharge 0·50, and this was admitted to be a fair example for comparison. Then there are Loughs Oughter and Gowna, counties Cavan and Longford, 309,000 acres, discharge 0·83. Lough Corib, county Galway, 780,000 acres, discharge 0·89. So that, when Mr. Manning puts the discharge from the 408,000 acres of the Barrow district at 400,000 cubic feet per minute, it is pretty sure that it will seldom if ever be exceeded. It might possibly be so to some extent in the course of twenty or thirty years, but it is safe as a calculation of frequent floods, which are, practically, the floods to be guarded against. For the upper parts of the district, and for smaller and steeper areas, the flood discharge is estimated at 3 cubic feet per minute per acre. On these bases the dimensions of the channels and other parts of the works are calculated, and the estimate for the work, including contingent expenses of sluices, &c., is 474,664*l.*, and, as the area of the land injured by the flood is 45,641 acres, the average cost per acre of this land would be 10*l.* 11s. 3d.

But here comes in an important consideration—whether only those lands which are directly benefited by the main or arterial drainage should contribute to the cost of the works, or whether the whole area within the watershed should contribute in some degree. A witness, Mr. James Stewart Kincaid, gave evidence on behalf of a landowner in the county Kildare, within the area to be dealt with, who is himself a trustee of some Drainage Boards. He has had a good deal of experience on many estates in different parts of Ireland, and said that the contribution to the drainage works should not be confined to the lower lands actually injured by floods, but should embrace the entire watershed area of each portion of the river, as regards the maintenance of the main waterway. "I would say that every acre of enclosed and profitable land which contributes its drainage or surface water to the river should bear a portion of the assessment of maintaining the waterway. There is no doubt that every one having land within the watershed area or catchment basin has a right of free passage for the water down to the sea; but, then, they should maintain that highway for the water in a proper condition. In this instance the taxable area would only amount to about one-eighth of the whole area, all of which ought to bear some proportion of the cost of maintaining the channel." He would charge a rate upon the whole area for maintaining the waterway, and another rate upon the lands actually improved. It is inequitable not to tax the upper lands at all, for, owing to the steeper declivities of these parts of the watershed area, the soil is more easily carried away, and they contribute not only the water which falls upon them and descends at a rapid rate,—they have a right, no doubt, to send down the water,—but they also send down what they have no right to send, that is the *débris*. Of course the rate for the upper lands should be a small one, and not at all equal to the rate upon the lands actually freed from floods. The only exception should be plantations. They delay the run of water off the ground and fasten the soil. Another witness, Mr. Joseph Fennell, agreed with this. He thought the whole area of the basin should contribute more or less, for the silt is brought from the higher grounds.

All the points of this subject of the improvement of rivers which we have brought forward from this case are such as will also have to be considered in any English case.

RECENT EXCAVATIONS ON THE ACROPOLIS.

THE first issue of the "Museums of Athens," the work to which we called attention a few weeks ago, has just appeared. It contains eight beautiful phototype plates, all of which are devoted to the illustration of the recent "find" near the Erechtheion. We may say at once that we have seen no finer phototypes; they are exceedingly clear, sharp, and effective. If the succeeding numbers keep up the same standard of execution, there is nothing left to desire, and criticism at a distance from the original will be rendered as little hazardous as possible. Plate I. shows the scene of the discovery and the excavators at work, with,—if our memory serves us aright,—M. Kabaddias himself inspecting operations. He gives us in the accompanying text some interesting particulars as to the actual circumstances of his find. At a depth of between 3 mètres to 4½ mètres below the ground the workmen came suddenly on a deposit consisting of three strata of sculptural and architectural remains, each stratum being separated by an intervening layer of rubbish stones. What we may call the "monumental" strata consisted of pedestals, statues, inscribed slabs, fragments of architectural decoration, feet and hands, heads, pieces of potsherd and some coal and earth; the rubbish stones which intervene between these layers are said to have come from the Acropolis wall. The theory respecting the burial of all this sacred treasure held by Dr. Kabbadias is as follows:—"When the Persians forced their way into the Acropolis they burned the Temple of Athene and demolished the statues which they met with here and there, throwing them from their pedestals, crushing and knocking off their heads, hands, and feet. The Athenians, on their return, determined to restore, and succeeded in restoring, the sanctuaries of the gods in a more beautiful and magnificent style; but the ruined statues were useless, not being objects of adoration, but simply offerings, and being ruined they had no longer any value. At the same time they wished to level the surface of the Acropolis by heaping it up and raising it, they were even compelled to do so in order to erect its splendid edifices. But for this heaping up they wanted material, and so they collected whatever was found on the surface of the Acropolis after the destruction by the Persians,—statues, inscriptions, also the stones of the burned and demolished building. These statues were then regarded by the Athenians after the Persian War as worthless, and therefore they made use of them to fill up and heighten the surface of the Acropolis. But supposing that they had a religious value, and a very high one, the Athenians, nevertheless, as they were in a mutilated condition, could use them to supply the material they required, and at the same time, depositing them in the ground, preserve them from every desecration."

This is, of course, pure theory, but it is possible that such a blending of religious sentiment and material economy might commend itself to the ancient,—as it assuredly would to the modern,—Greek mind. We may note, once for all, with regret, that the English version of the text is very feeble and long drawn out and far from clear; in fact, either the French or German version is easier reading. Perhaps, had England, as well as Germany and France, possessed her archæological "school" at Athens, some member of it might have revised for us the English text.

After all, however, the main value of the publication is not the commentary, but the plates. Seven of these give us six of the most important statues discovered, one in two views. These statues, as is well known, are for the most part of uniform type, though in details they offer peculiarities of treatment. They represent a female figure,—whether goddess, priestess, or worshipper, is as yet unknown,—in standing posture, draped in long chiton and himation. The hair is arranged in long formal curls, and bands falling before and behind; on the head a head-dress, ornamented with various patterns. The right hand in some of the fragments contains a fruit. The type, as a whole, is near akin to the archaic female torsos found at Delos by the École Française, but the work of the Athenian statues is much finer. They have also this marked advantage, that they have been originally richly adorned with colour, which has remained in remarkable good preservation; red, blue, green, light-grey, are all still clearly to be seen. A very noticeable feature in several of the statues is a "large upright bar of bronze" just in the centre of the skull. M. Kabbadias conjectures that, if, as is supposed, these statues stood in the open air, this may have served as a support for an umbrella to protect them from sun and rain. Such a protection would be specially necessary to statues so richly coloured.

Another noticeable thing about the statues is that the pieces of which they are made up are found together in a peculiar, and, so far as we know, unique fashion; one of the portions to be joined has a long stone projection of wedge shape, and thus fits into a corrresponding hole. The junction is made more secure by being cemented with a white substance, which experts declare to be lime.

Nothing definite is known about the sculptor of these statues; but among the inscriptions found occur the names of six artists, one of them known to us by literary tradition, Antenor, who made the statues of Harmodios and Aristogeiton. Eight more plates relating to these discoveries are promised for the next issue.

THE LOTTERY LOAN FOR THE PANAMA CANAL.

THE *Projet de Loi*, having for object "To Authorise the Universal Company of the Interoceanic Canal of Panama, to issue a Lottery Loan," which was presented to the Chamber of Deputies, on the 17th ultimo, is signed by the President of the Republic, and by the Ministers of the Interior, of Finance, and of Public Works. The *Exposé des Motifs* states that M. Ferdinand de Lesseps, on the 27th of May, 1885, addressed to the Minister of the Interior a letter, which is reproduced *in extenso*, asking for the authorisation to issue a loan of 600 millions of francs by way of lottery. M. de Lesseps states that 471 millions of francs had been called up, and expended or engaged for the execution of the canal, and that 12 millions of cubic mètres (being less than ten per cent. of the estimated total) of excavation had been moved. The persons interested in the canal are 102,116 shareholders and 217,623 loan or bond holders. The approximate cost of the construction of the canal was estimated by M. Voisin, in 1879, at 1,070 millions of francs. The tariff of 15 francs per ton (or rather more, per mile, than three times that of the Suez Canal), is proposed; and the annual charge of 6½ millions of francs is put down for maintenance and working.

On receiving the application the Minister of Public Works sent, in December 1885, M. Rousseau, an engineer-in-chief of the Ponts et Chaussées, to Panama, to report on the state and prospect of the undertaking. M. Rousseau's report has not been published, but the *Exposé des Motifs* says: "M. Rousseau, in his conclusions, admits the possibility of succeeding in piercing the Isthmus of Panama; he points out the grandiose character of the work, the importance of the efforts already made, and the interest which attaches to ensuring its success by the means of a French company. He adds that, as the approbation of the designs and the contracts is beyond the province of the government, as well as the direction of the works, the enterprise presenting in other respects serious contingencies, the government cannot give to the company either counsels or any guarantee."

But the government, in M. Rousseau's opinion, ought to make sure that the company pursues its work with reflection; that it does not ignore its difficulty, and that it should guide its measures by the advice of men considerable for their science and moral authority

—in a word that the future measures should be submitted to a serious and profound study.

The Government, on this, applied to the Company for a special report on the undertaking, and the latter replied that, while the technical Commission did not deny the difficulties which opposed the realisation of the programme, it expressed the conviction that they could be overcome. It was of opinion that the 600 millions now applied for would be "at least sufficient to conduct the enterprise to a degree of advancement which would, it thought, leave no doubt as to a final success, which might be assured by means of a last effort, measurable with precision."

It should be noted that the original capital of 12,000,000*l.*, together with the loans already raised in 1882, 1883, and 1884, come to an aggregate of 36,747,740*l.*, which the lottery loan will raise to 60,747,740*l.*, or upwards of a milliard and a half of francs. The length of the canal is 45 miles. The decree with which the *Projet de Loi* terminated authorises the issue of a loan to the amount of 600 millions of francs, at a rate of interest not less than 3 per cent., and not more than 4 per cent.; the difference between the two rates being distributable by way of lottery.

The actual debit of the Company is as follows:—

To original capital (including 10,000 shares given to Promoters, as paid up)	£12,000,000
To 5 per cent. loan of Sept. 7, 1882	5,000,000
To 3 per cent. loan of Oct. 3, 1883	12,000,000
To 4 per cent. loan of April 25, 1884	7,747,740
	£36,747,740
To lottery loan	24,000,000
	£60,747,740

The interest that the Company is paying out of capital is:—

5 per cent. on £12,000,000	£600,000
5 ,, ,, 5,000,000	250,000
3 ,, ,, 12,000,000	360,000
4 ,, ,, 7,747,740	309,909
	£1,519,909
Add ½ per cent. on loans for amortisation	123,369
Present annual charge	£1,643,278
Add 4½ per cent. on lottery loan and amortisation	1,080,000
Annual charge when new loan is raised for interest and amortisation	£2,723,278

From the proceedings which have taken place before the Committee of the Chamber of Deputies, it appears that M. Rousseau has distinctly reported as to the impossibility of completing the canal for the sum above stated. M. Jacquier, an engineer-in-chief of the Ponts et Chausseés, who has been recently appointed Director of Works on the canal, has given evidence that, in his opinion, it will be impossible to construct the canal without locks. As to this, M. de Lesseps states that he has not come to any decision, but would act according to the requirements of science. Judging from the section of the line, and the necessity for obtaining a full water supply for the summit pond, a cutting of 200 ft. in depth may be avoided. But this would require forty locks, of 10 ft. lift each, or equivalent works. This, under the most favourable circumstances, would add four hours to the time for transit in one direction. And, as to backward and forward traffic, the experience of the Suez Canal seems to indicate that the locks must be double.

Llandovery.—The memorial stones of "The Williams Pantycilyn Memorial Chapel" were laid on June 16th by Messrs. David Davies, M.P., and D. Pugh, M.P. The style of the building is Gothic of the Decorated period. Accommodation is provided in the chapel for about 260 persons, and in the schoolroom at the rear for about eighty. The cost will be about 2,200*l.*, and the contract is being carried out by Mr. Morgan, builder, Swansea, from the designs and under the superintendance of Mr. J. H. Phillips, of Tynte Chambers, Cardiff.

NOTES.

THE discussion on the subject of Tiryns at the special meeting of the Hellenic Society last week, of which we give a full report in another column, cannot be held to have established a case in any certain or conclusive manner for either of the views maintained. That Dr. Schliemann and Dr. Dörpfeld should have thought it worth while to come over from Athens to give their personal answer to the criticism of Mr. Penrose is a high practical compliment to that eminent English student of Greek architecture, and a proof that the German *savants* admitted that there was something that called for a reply. Dr. Schliemann was received with the cordiality which his energy and enterprise and his remarkable career as a discoverer must ensure for him everywhere, but it cannot be said that he made any figure as an advocate of his own views, as his speech in reply to Mr. Penrose almost entirely evaded the arguments brought forward by his English critic, and was little more than an *ad captandum* appeal to the sympathies of his audience; and had it not been for Dr. Dörpfeld's assistance he must have been adjudged to have lost his case. Dr. Dörpfeld, who thoroughly secured the respect of his audience, and whom we are very glad to have seen among us, gave a thoughtful and well-considered *résumé* of his reasons for believing in the antiquity of the Tiryns remains, and his reference to the "personal" feeling pervading the attack of Mr. Stillman in the *Times* seems not to be without reason. The real point which remains for contention is that of the date of the employment of the tools, the tubular drill and saws, of which the marks are found on the stones of the Tiryns walls. Dr. Dörpfeld admits the marks, but insists on the ancient character of such tools; on which point Professor Middleton, whose recent work on Rome has established his reputation as an extremely acute observer, is with him. Both Professor Middleton and Dr. Dörpfeld made a strong point in favour of the prehistoric view by references to the archaic character of the frieze of κύανος, which we selected for illustration as the most remarkable of the details figured in Dr. Schliemann's book, and which Dr. Dörpfeld showed very logical reasons for believing was discovered in its original position. On the other hand, there are some curious discrepancies as to fact between Mr. Penrose and Dr. Dörpfeld, the latter asserting that no bricks were found except in the admittedly Byzantine remains, while Dr. Schliemann appears to have admitted the bricks, but attributed their appearance to the action of the conflagration. We quite concur with Mr. Penrose in the conclusion that previously unburned bricks could never assume the similitude of regularly burned bricks by the accidental process of a conflagration; so that here is a double discrepancy as the result of this triangular duel. Dr. Dörpfeld, again, showed some of that too great readiness of belief which we remarked on in reviewing his chapter in the "Tiryns" volume (which, in fact, makes the architectural value of the book). His argument that a wall is to be reckoned as the same age with the Cyclopean wall, because it is built parallel with the latter, can hardly be accepted as sound, except by those who are very desirous to agree with him. The defence of Dr. Dörpfeld and Professor Middleton, however, in favour of the pre-historic theory is strong in many points; and the case for the present remains an open one.

THE case of Nosotti *v.* Saunders is perhaps the most interesting to readers of this journal of any of the decisions which have been given during the last month or two. It decided that a person who is asked to tender for work cannot, if the work goes off, receive from the employer any cost incurred in making out the tender, unless there has been an express contract with the employer that he will repay these expenses. From a legal point of view nothing can be clearer than this, and we confess to some surprise that the question should ever have been raised. But, since it has been argued and decided, it must be noted as a legal decision which should be borne in mind by all builders and contractors. If they are likely to be put to expense in getting out a tender, they should, before doing so, obtain an undertaking that such expense will be repaid. If they prefer to trust to chance, they cannot complain if from time to time they are out of pocket by sending in tenders which are not accepted.

IN reference to the drawing by De Witte, dated 1669, in the collection at the Institute of Water-colour Painters, Mr. J. C. Robinson denies that it is a real De Witte, or of that date, and asserts that it is only a water-colour copy, at a much later date, of one of De Witte's oil-paintings.

THE business of the Light and Air Special Committee of the Institute of Architects, which has been in existence three or four years, is to be transferred, we understand, to one of the standing committees of that body. The special committee on this subject has in one sense been very much a standing committee, and we have doubts whether the committee to which the business is now referred will be able, for a long time to come, to make any report. Whether in the end any practical result will be obtained from the deliberations and the investigations of these committees is doubtful. But no doubt, when their report is published,—perhaps we are over sanguine in looking so far into the future,—it will be certain to contain much interesting material; and if these bodies produce no other fruit, they will only be like innumerable Government Committees, whose labours are to be seen in piles of almost-forgotten blue books.

FROM the Δελτίον τῆς Ἑστίας (No. 489) we learn that the upper part of a very fine statue,—the lower half of which was dug up some months ago,—has been discovered on the Acropolis. The face is reported as of very fine workmanship, the iris of the eyes and the lips are painted red, and there are other remains of colour. On the head is a wreath. The style is archaic, but the modelling of the limbs is distinctly seen beneath the drapery, which is full and heavy. The statue is life size; it has been placed in the Central Museum.

OUR contemporary *Invention* says that the latest rebuff to the press has been administered by the South Kensington authorities to the *Chemist and Druggist*, whose representative was refused admittance to a "conference" on some subject of interest to the readers of that journal, on the ground that "the question of allowing representatives of the press to report the proceedings had not been raised." We are able, from our own experience, to corroborate the remark made by *Invention*, that "the importance of the scientific and technical press is curiously under-rated by the powers that be at South Kensington." There is a "Literary Superintendent," it is true, but representatives of the press object to being "superintended" by any but those to whom they are responsible. It is evidently no part of the "Literary Superintendent's" duties to see that the press have adequate facilities for doing their work, for it was only after repeated applications for a press pass for the Colonial and Indian Exhibition that we obtained one. The same thing occurred last year in relation to the Inventions Exhibition. It is usual in connexion with other exhibitions, even where there is no "Literary Superintendent," to offer the usual facilities for the free admission of the properly-accredited representative of every journal which can fairly claim to be interested in the contents of the exhibition. But, to do them justice, niggardly as the authorities at Kensington are in the matter of press passes, they are very liberal in dispensing printed circulars and paragraphs for insertion in the news columns of the journals to whom they are so illiberal in other respects.

THE Employers' Liability Act has given rise to far toa much litigation. For the parties to actions arising out of it are, on one side, usually persons ill able to embark in litigation. A case reported in the July number of the *Law Reports*, Howe *v.* Finch, further explains this Act. The first section speaks of "defects in the condition of the . . . works . . . connected with or used in the business of the employer." A Court of the Queen's Bench Division has held that this means works actually used for a business, not works in course of construction or intended to be so used. In the case in question a part of an incompleted wall fell on the workman. This wall formed part of a warehouse not yet in use. Both the County Court Judge and subsequently the Divisional Court decided that there was no remedy under the Employers' Liability Act, but they gave their opinion that there was a right of action under the general law for negligent construction ; but with this we are not now concerned.

THE Richmond Vestry have now resolved to apply to the Local Government Board for sanction to borrow, on the security of the district rates, the sum of 96,000*l.* for the construction of their Mortlake drainage scheme, by which they have now decided to stand or fall. But the opposition to the scheme is strong, and the Local Government Board inquiry into the application for the loan is likely to be a protracted one. It shows with what leniency the Thames Valley Urban Authorities have been treated, when it is mentioned that though Richmond, under the provisions of the Thames Conservancy Acts, 1857 and 1864, and the Thames Navigation Act, 1866, and subsequent Acts, is forbidden to divert its sewage into the Thames, that town still allows large quantities of sewage to flow into the river. It may be mentioned that the adopted scheme is that of Mr. John Charles Melliss, C.E., who proposes to convey the sewage to a plot of land at Mortlake, where it would be purified ; the site, eleven acres, is to be purchased from Mr. Thomas Keane Fitzgerald for the sum of 10,000*l.* In the carrying out of this scheme the Richmond Rural Sanitary Authority and the Richmond Vestry unite, and the parishes comprehended in the scheme will be Barnes, Mortlake, Kew, and Petersham. The present rateable value of the district of the Richmond Urban Authority amounts to 167,970*l.* ; and that of the Rural Authority to 137,227*l.*

A CORRESPONDENT draws our attention to the fact that in the accepted design for the Sunderland Municipal Buildings, which we published on June 26th, some of the chimneys which must exist according to the plan, are ignored in the elevation ; this appears to be the case, unless the flues are artfully carried away into some unseen stack in the rear. The omission in competition elevations of necessary features which are shown in the plans, but which would injure the effect of the elevations, is, we fear, not an uncommon form of evasion of inconvenient facts, which ought not to escape the eagle eye of "the assessor."

DR. SCHLIEMANN'S DISCOVERIES AT TIRYNS.

SOCIETY FOR THE PROMOTION OF HELLENIC STUDIES.

UNDER the auspices of this Society, a special meeting was held in the Rooms of the Society of Antiquaries, Burlington House, on Friday, July 2, for the purpose of discussing the questions at issue between Dr. Schliemann, Dr. Dörpfeld, and others, on the one side, and between Mr. Stillman (the *Times* correspondent at Athens), Mr. Penrose, and others on the other side, as to the antiquity of some of the remains discovered by Dr. Schliemann at Tiryns. There was a very crowded attendance.

Mr. John Evans, President of the Society of Antiquaries, was voted to the chair, and expressed his satisfaction that Dr. Schliemann and Dr. Dörpfeld had come over expressly to defend their views against their critics.

Mr. Penrose's Remarks.

Mr. F. C. Penrose opened the discussion by reading the following paper :—

When I visited Tiryns in April last I little thought that I should be called upon to say anything about it on a public occasion, but circumstances not of my own seeking have led to it, and now I am not proposing,—indeed, I am not able,—to come before you with any detailed statement. My visit to Tiryns and Mycenæ was a very hurried one, undertaken solely in the desire to understand better Dr. Schliemann's descriptions. My companion, however, whose letters in the *Times* are doubtless familiar to you, had been over the ground before, and was also familiar, by the study of many years, with Pelasgic work in Greece and Italy. We were led by what we saw both at Mycenæ and Tiryns to doubt the extreme antiquity assigned by Dr. Schliemann to the remains he has excavated, and I gave my companion leave, if he thought fit, to state that I agreed with him in this respect. As to any suggestion of the date which ought to be attributed to them, it was a mere matter of conversation, and nothing more. The only question which I wish to raise is this, Do the walls which have been uncovered by Dr. Schliemann belong to the same epoch of civilisation as the so-called Treasury of Atreus and the Gate of the Lions at Mycenæ? It is more convenient to take these works as the standards than the walls of the citadel of Tiryns itself, which are probably of a still earlier date. But whilst raising this question, far be it from me to undervalue the munificence, the zeal, and self-devotion of Dr. Schliemann and the very remarkable discoveries which he has made (applause), and, if the end of this discussion should be to establish more firmly than before the pre-Homeric character of the remains referred to, it will give me much more pleasure than would the contrary conclusion ; but, when I think of the character of the work I saw at Tiryns and Mycenæ, notwithstanding all I have read or heard since on the subject, I must think that a case can be made out for still further sifting the evidence before these structures can be assigned unquestionably to the Pelasgic epoch ; but such examination ought to be conducted carefully and leisurely, and with freedom from mental bias. I readily admit that very strong arguments are adduced in Dr. Schliemann's books on Tiryns and Mycenæ in favour of the great antiquity of his discoveries ; but an examination such as I have advocated is wanted to satisfy those who are studying the subject that he has not,—as very naturally might be done by one who is so fully persuaded as he himself is,—overlooked circumstances which tell against his view.

The position I take up is this, that there is such a fundamental difference in character of work between the undoubted Pelasgic architecture of Mycenæ, that is the Treasury and the Lion Gate, &c., and the so-called Palace of Tiryns, that they have nothing whatever in common. The meanly-built walls of the latter, generally of quite small stones, easy for one man to lift, but with somewhat larger stones inserted here and there, which have been worked with the saw and chisel, and also with a tubular metal drill, and with, not unfrequently, bricks introduced,—fairly burned red bricks, and burnt lime-mortar in many places,—all these circumstances seem to be quite inconsistent with the Pelasgic period, and they appeared to pervade the larger portion of the walls. Dr. Schliemann seems to attribute the presence of burned bricks to the action of the conflagrations which have destroyed the palace. In the opinion of an experienced brickmaker whom I have consulted, no regular bricks could be produced from sun-dried bricks built up in a wall by such a cause, although they might be partially vitrified in an irregular manner, and would probably be cracked.

The bricks I am referring to had all the appearance of kiln-burned bricks, whereas the stones of the undoubted Pelasgic walls are large, dressed without metal tools. They have their surfaces even, but undulating, having been smoothed by rubbing, and not by cutting tools, and the drill-holes which are found in them are quite different from those in question, the figure of the cut being exactly what would have arisen from the action of a hard stone point. The saw cuts, too, which are seen all over the newly-discovered remains, are not found in the standard Pelasgic works. Dr. Schliemann in his book certainly notices these saw-cut stones, and still maintains their antiquity ; but is it possible that a people who used only bronze for their weapons could have used steel or iron for their workmen's tools? The tendency, alas! of the human race is to adapt every invention that increases force to the service of war.

Certainly at Mycenæ, and I think at Tiryns, there are, mixed up with the walls claimed as pre-Homeric, stones taken from older structures as borrowed materials, — and these appeared to me as of regular Hellenic workmanship of classical times. At Mycenæ, part of the house adjoining the tombs is built over a well in such a manner that the well could not have been used after the house was built. That the plan of the building at Tiryns is that of a Greek house I do not question ; but that it coincides with Homer's plan is disputed by so high an authority as Professor Jebb. The analogy of certain very rude and mean walls recently unearthed on the Acropolis of Athens has been thought to confirm the date of the Palace of Tiryns ; but the walls of Athens, though they seem to be older than the Persian invasion, carry us only a very small way backwards towards the age of the Atridæ. That in their meanness of construction they have analogy with the Tirynthian walls may be allowed. But, indeed, they are probably mere foundations, whereas the walls at Tiryns are above the pavement. Their mean and slovenly construction appears to me to be about the strongest argument against these walls being the work of the great Pelasgic builders, namely, that the same men could not have done both. It would seem that these builders could not venture to tackle a stone which weighed a few hundredweights, whereas the Pelasgic builders lifted up a stone more than 120 tons weight to form the lintel of the door of the so-called Treasury of Atreus. To these archaic builders it would have been easier to have placed the stones in bulk in the walls than to have reduced them to fragments. These remarks apply quite as much, or more, to the house and tombs at Mycenæ. I believe the treasures and pottery found at Tiryns, as well as at Mycenæ, have their own difficulties before they can be recognised as pre-Homeric, but they cannot of themselves prove the great antiquity of the structure in which they were found. I must leave to others the discussion of the objects found in the tombs at Mycenæ, observing merely that, if a single specimen can be shown to belong to a later epoch, it brings the whole collection down to its level, whatever may be the probable date of all the rest. Only on three points will I venture a remark. There is some similarity, I think, between the buttons, or *bullæ*, found in these tombs and others found at Olympia, which, of course, cannot be pre-Homeric. A comparison between these is desirable. Again, the swords, especially those of the leaf pattern, have great resemblance to swords with which we are familiar in the North, of Celtic or Teutonic make. And I lately saw, in the Museum at the pump-room at Bath, a mask, of which I produce a photograph (obtained for me by the kindness of Mr. Elton), which has a remarkable family likeness, although of meaner material, with the golden masks of the Mycenæ tombs. This mask, made of lead or a kind of pewter, was found among the Roman baths, and was probably used in the sepulture of some Celtic ally of the Romans, in the first, second, or third century of our era.

As respects the decorations,—I speak from the drawings, for I did not see the originals,—although there may be some archaic character about them, they are so rude and inartistic that they might be bad imitations of earlier work. The pottery fragments seem to be of a very mixed character. That there are some archaic specimens on so ancient a site is not surprising ; but these fragments are, to say the least, inconclusive, except so far as to show that the site has been occupied and reoccupied, and that the walls we now see may be entirely or chiefly of the latter construction. However, as I said at the beginning of this paper, I make these statements in the hope that these newly-discovered works may be examined by those who have opportunity, research, and leisure to go carefully into all doubtful points ; and, if the final report should be in favour of their great antiquity, I doubt if any one, except, of course, Dr. Schliemann and Dr. Dörpfeld, will be more gratified than I shall be (applause).

Dr. Schliemann's Remarks.

Dr. Schliemann, who was very enthusiastically applauded on rising, next addressed the meeting. He said that in July, 1876, he solicited and obtained from the Greek Government permission to excavate at Mycenæ, because, by a certain passage in Pausanias, which he considered to have long been misunderstood, he hoped to find the tombs which had been shown to that traveller as those of Agamemnon and his companions. On his way to Mycenæ he had to pass by Tiryns, and he could not resist the temptation to stop a week to sound the ground of that ancient stronghold. The surface of the soil on the upper plateau appeared to be very uneven, owing to a number of house walls, apparently composed of lime and bricks, which peeped out all over the surface and formed hard and compact masses, so that he could not cut them, even with an ordinary pickaxe. He then thought most decidedly that those walls were late Byzantine, and that they belonged to a villa of the eleventh or twelfth century of our era. He was strengthened in that belief by the floor of lime and concrete, now covered up with pebbles to the depth of from 3 ft. to 5 ft., between the walls, as well as by some potsherds of a distinct Byzantine character found in the place where, two years ago, had been found what were believed to be the fragments of the walls of a Byzantine church, and fifty or sixty Byzantine tombs. His hearers would generously pardon him as a layman in architecture for the mistake made by him, when they considered that all travellers, even the greatest luminaries in architecture, who had previously visited Tiryns, had fallen into the same error. If it had been otherwise, the prehistoric palace of Tiryns would have been excavated years ago, and would not have been left to be discovered by himself and his *collaborateur*, Dr. Dörpfeld. The architecture of the ancient Greek house had hitherto been a great mystery to them all. They could not boast of knowing the plan of a single dwelling-house, and therefore it was natural that their discovery of a vast palace of remote age should be received with incredulity. It was not surprising that Dr. Dörpfeld should be mistrusted, and that it should be here believed that he had mistaken a Late Byzantine villa for the vast palace of Agamemnon. Such a suspicion could not have been put forward in Germany, because there the character of the man and his achievements were too well known. He was a leading architect, and was entrusted with the charge of the German Emperor's excavations at Olympia. It was not surprising that the greatest men of science went out to Tiryns to discover the truth. But to such investigators he would say that it was necessary not only to look at his book, but to study it, and take it with them and to test the remains by the plans figured in it, and which the late Mr. James Fergusson had called masterpieces of architectural skill. Probably some of his critics had never read his book on Tiryns, and perhaps had not even seen it before they went out. Without having the plans before him, it was impossible for the visitor to the remains at the present moment to clearly understand what he would see, because the floors had, by order of the Greek Archæological Society, been heaped up with earth, in order to preserve them from injury by exposure, and, therefore, nothing could now be seen of the work; but with the plans in hand the visitor could easily have ascertained all he wanted to know by digging a little, or even by removing some of the covering earth with his foot. That was the reason why they made the enormous blunder of mistaking the walls of a prehistoic for those of a comparatively modern Byzantine structure of lime and brickwork. Walls which appeared to some of his critics to be of lime and brickwork were really composed of quarried stones pointed with clay mortar. The quarried stones had been calcined by the burning of the beams and pillars of wood by which the space within the walls was divided, and the same act of combustion, acting on the clay joints of the walls, had produced all the appearance of very well-burnt brick walls. The traveller now saw, or thought he saw, brick everywhere, particularly in the glare of an Oriental sun. How easy it was to see in walls what there was not, and to make mistakes of more than two thousand years in stating the antiquity of such remains. [There was some apparently ironical applause at this point.] Mr. Stillman, according to his letters in the *Times* of April 24th and 29th, went to Tiryns accompanied by his (Dr. Schliemann's) much-honoured friend, Mr. Penrose, with an eminent Oxford professor, and two distinguished members of the American School at Athens; they arrived at the conclusion that the walls were Celtic, and belonged to the third century B.C., and that the tombs must have been of the time of King Pyrrhus, 285 B.C. But was it not an historical fact that the Celts never reached the Peloponnesus, and that the walls which his critics believed to have been built before Christ were not yet ten years old? They were misled by the very shabby look of the buildings, and what they thought could only have been built by the Celtic barbarians were really the foundations of prehistoric buildings which had always been underground. He said those walls were not ten years old, because, as could easily be seen, the Archæological Society of Athens, in reconstructing them, had taken some of the materials brought up by his excavations, and used them, belonging to classical times as they undoubtedly did, almost intact. He thought it almost superfluous to reply to the objection raised that walls of quarry-stones bonded with clay mortar were unworthy of the Heroic age, and that they were the work of the barbarous builders of late Byzantine times, because it could be easily proved that in prehistoric times the lower parts of all house-walls were of quarried stones and clay, and the upper part of sun-dried bricks. He had found them in the remains of all the five successive cities of Troy, in Samos in Cephalonia, in all the treasuries of Mycenæ, in the thalamos of Orchomenos, in walls on the Acropolis at Athens, and last, not least, in a prehistoric city of the Island of Thera, where they were found buried in three layers with volcanic stone and ashes more than 2,000 years older than the Byzantine Empire of 395 years after Christ. It was a stubborn fact that an ancient ruin might be more ancient, but could not possibly be less ancient, than what they found upon it. Now, they found on the walls of the palace at Tiryns a thick layer of lime, polished and smooth, and covered with decorative patterns accordant in character with the most ancient that had ever been found, and, most important of all, the thalamos ceiling. Such remains had been found by M. Renan in Syria. He himself had found them at Mycenæ, and they could be seen at Thera and Therasia. Generally speaking, the objects found were in shape, in fabric, and manufacture like those found at Mycenæ, except the terra-cotta idols, the arrowheads, and the knives of obsidian, which for rudeness could only be compared to those found in his excavation of the great tomb of Marathon, which had been thought to be the tomb of the 192 Athenians who fell at Marathon, but which was probably nearly 300 years older than the battle of Marathon. Dr. Schliemann went on to say that he hoped that other scholars, after having read his book on Tiryns, would go with it to the site of his discoveries and examine the remains on the spot by the light of the plans which he had given. His *collaborateur*, Dr. Dörpfeld, and himself would willingly leave it to the gentlemen of that illustrious society to say whether the result of their hard work at Tiryns deserved to be called "one of the most extraordinary hallucinations of unscientific enthusiasts which literature can boast of," a title which the *Times* correspondent, Mr. Stillman, very liberally bestowed upon it. He asked whether they deserved the censure of Mr. Stillman, a man who never in his life made an excavation, and probably had never witnessed one? In his letter to the *Times* Dr. Dörpfeld had proposed that Mr. Stillman should accompany him to Mycenæ and Tiryns in order that he might have the remains explained to him, but Mr. Stillman had chosen to leave that honourable proposal unnoticed. In conclusion, Dr. Schliemann said,—I assure you that the terrible outbreaks of scorn and contempt in this country have not in the least daunted or discouraged us in our disinterested labour. Indeed, we have just now planned an excavation on a vast scale on an island which has hitherto been virgin soil to the archæologist, and which every student must desire to be explored, and by none will it be desired more than by the great Hellenic Society, whose appreciation will be a great encouragement to us in the new campaign (applause).

Dr. Dörpfeld's Remarks.

Dr. Dörpfeld having made a few prefatory observations in German, Professor Newton read the following translation of Dr. Dörpfeld's detailed reply:—

I have accepted with great pleasure the invitation to give you my opinion, as an architect, on the results of the excavations at Tiryns and Mycenæ. Having had the good fortune to assist Dr. Schliemann in his excavations of recent years, I am in a position to give you every information that may be desired on the architecture of the buildings at Troy, Mycenæ, Tiryns, and Orchomenos. Whoever of this honoured company may have any doubts regarding the architecture or the age of the edifices brought to light in those places, will, I hope, bring them forward.

Some time ago doubts were expressed in the *Times* regarding the age of the buildings at Tiryns and Mycenæ. The correspondent of that newspaper at Athens, Mr. Stillman, has maintained that the buildings at Tiryns, and the tombs of Mycenæ, which are designated as Heroic, were constructed in the Macedonian time by a Celtic tribe. In a second article he, however, corrected himself, and declared the Palace of Tiryns to be Byzantine. I have no fear of any scholar approving the peculiar assertions of Mr. Stillman; however, it is but natural that many a man should again have put to himself the question, Is it, then, really certain that the Palace of Tiryns and the Tombs of Mycenæ date from the Heroic age? We would also propose to ourselves this question once more on this occasion, and I will endeavour to give you an answer to it from an architect's point of view. I will first propound another question. How were the Homeric Royal Palaces constructed, and what would be the appearance of walls which we might with confidence declare to have belonged to such palaces? It is a universal opinion that nearly all the buildings of the Classical age were made of squared (or rectangular) stones; and consequently many persons believed that the ancient Royal Greek palace consisted of rectangular work, and hitherto if walls of a different construction were excavated, they were generally considered not to be Greek. If they were built with lime mortar, they were held to be Roman or Byzantine; but, if of irregular quarry stones, bonded with clay, they were declared to be barbarian or modern, and people did not hesitate to destroy them; but this opinion, in consequence of which we have hardly any plans of a Greek dwelling-house, is altogether erroneous. Not only have we many occasional references in ancient historians, but our principal authority on antique architecture, Vitruvius, so expressly states the contrary, that it excites wonder how such an erroneous opinion could ever have originated. Vitruvius describes the different kinds of masonry, and he praises, above all, the walls of sun-dried bricks, whilst walls of quarry stones, bonded with mortar, lose every year in value, as they last at most only eighty years. Walls of unbaked bricks always maintain their value, "Quanti fuerint olim facti tanti esse semper estimantur." Therefore, not only public buildings and private dwelling-houses, but also royal palaces, were built of unbaked bricks. Of the latter class, he mentions as examples the Royal Palace of the Attalidae in Trolles; the Palace of Crœsus at Sardis; and, lastly, the palace of the powerful king Mausolus of Halicarnassus. He concludes by saying:—

"Cum ergo tam magna potentia reges non contempserint latericiorum parietum structuras, quibus et vectigalibus et præda sæpius licitum fuerat non modo cementicio aut quadrato saxo sed etiam marmoreo habere, non puto oportere improbari quæ sunt e latericiâ structurâ facta ædificia."

The buildings discovered agree entirely with this description of Vitruvius. In many places in Greece and Asia Minor, city walls, the temples, and dwelling-houses of sun-dried bricks have been found. I will here only specify Eleusis, Olympia, Athens, Tiryns, Mycenæ, and Troy. Everywhere the walls of unbaked bricks consist only in their upper parts of that material, but in the lower parts they are composed of irregular stones, with or without clay mortar, and they are on both sides wainscotted with clay or lime plaster, which is often covered with painting. Their angles are provided with regular cut squared stones, or with timber beams. Now, if we consider that the same style of architecture occurs in a great many of the most ancient edifices of Mesopotamia and Egypt, there can hardly be a doubt that the Greeks learned it from the people of those countries, and that in Greece, even from the remotest ages down to the Roman conquest,

the buildings were principally constructed of quarry stones, bonded with clay mortar, and of clay bricks. Of regular square blocks only a small number of buildings have at any time been erected, and these especially after the Persian War. He who in the teeth of these facts still maintains the opinion that walls of quarry stone, bonded with clay mortar, or of clay bricks, cannot date from the Classical or the Heroic age, shows that he has bestowed but little study on the art of building among the Greeks and Romans. To our first question, therefore, "What would be the appearance of walls which we might with confidence declare to have belonged to the Homeric royal palaces?" we must give the answer that walls of irregular quarry stones and clay, or of unbaked bricks, could very well belong to an edifice of the Heroic age. We might even go so far as to say that the walls of a Heroic palace can hardly have been constructed in any other fashion. But, as in Oriental countries, from the remotest ages to the present time, walls have been made in the same simple way, it is clear that it cannot at once be discovered from a wall of quarry stones and clay from what period it dates. If in the course of our excavations we come upon such a wall, we cannot at once say whether it dates from Heroic, or Classical, or Mediæval, or Modern times. We possess, however, several indisputable means of determining the age of such walls. (1) The later a wall is, the greater is the probability that, besides the simple quarry-stones, there will occur other materials (fragments of Classical buildings, pieces of baked bricks, and especially clay tiles). If such products of Classical or later times are found in the wall, it is certain that the wall cannot date from the Heroic age. (2) If a wall is wainscoted with lime, and covered with paintings, the determination of its age can present no great difficulties. As a wall cannot possibly be later than the plaster with which it is covered, a wall which is decorated with paintings of the Heroic age must date at least from that time. (3) The antæ of the walls, the free-standing columns, and the door sills, must in the case of clay walls be made of more substantial materials (such as stone blocks or wood). Since it is well known how stone blocks were wrought in Classical times, and how they were wrought in Heroic times, we can, from the workmanship of the parastades, of the column bases, and the door sills, determine the age of the walls. (4) It is self-evident that the individual finds of potsherds, bronzes, &c., which are discovered above, near to, or below a wall can be brought forward in evidence for the determination of its age; but I, as an architect, will not take this point into consideration. Let us now apply these propositions to the case of Tiryns. (1) All the walls of Tiryns which are indicated on the plan as belonging to the Palace consist in their lower parts, from the rock up to their present height, of quarry stones bonded with clay; in their upper parts, partly of the same materials and partly of unbaked clay bricks. I myself have ascertained during my four months' residence at Tiryns, and other architects have confirmed my impression, that the walls contain no trace of other materials (such as fragments of Classical buildings, pieces of baked bricks, or tiles). At first sight one is apt to believe (as has happened to many travellers, including Mr. Penrose and Mr. Stillman) that some of the walls are built with lime mortar, but any one who has bestowed on these walls a close examination will recognise that originally they consisted of quarry stones bonded with clay, and that the conflagration by which the whole palace was destroyed altered some parts of the walls. The quarried limestones were calcined by the fire and slackened by the rain, and so, in conjunction with the red baked clay, they were transformed into a solid mass. Walls which contain other material besides quarry stones and clay occur only in the southern part of the Acropolis of Tiryns, and belong partly to the foundations of a Byzantine Church, partly to Byzantine tombs. They are accurately indicated on the plan, and one recognises at once that they have no connexion whatever with the walls of the Palace. Inasmuch, therefore, as these do not contain any later materials, they can very well belong to the Heroic age. (2) In the apartments of the Palace many fragments of wall-plaster, with paintings on them, were found. For the most part these fragments had fallen from the walls and were lying on the floor. Some of them, however, are still adhering to the walls. The ornaments represented on the fragments agree perfectly with those which we find on the stone reliefs of the dome-shaped tombs at Mycenæ and the famous ceiling of the Thalamos in the dome-shaped tomb at Orchomenos. But, as nobody has ever doubted the great antiquity of the dome-shaped tombs, the wall paintings of Tiryns, and consequently, also, the walls themselves, must date at any rate from the pre-historic age. (3) With regard to the working of the square blocks of the antæ and the door-sills in Tiryns, it was carried out with a stone saw, the simple pickaxe, and the cylindrical borer, that is to say, precisely with those instruments the application of which is so characteristic of the dome-shaped tombs and the Lions' Gate at Mycenæ. The pick, with several separated teeth, which was always employed for the building stones of Classical times, was not used for the squared blocks in Tiryns. We cannot find fault with the *Times* correspondent for being unacquainted with these details; but, as he has, nevertheless, written on this subject, he has had the great misfortune to adduce the best proof of the great antiquity of the walls of Tiryns and Mycenæ as an evidence of their Celtic origin. Mr. Stillman found in Tiryns and Mycenæ stones bearing distinct traces of the application of the stone saw, and thereupon having boldly, and without any proof, assumed that the stone saw only occurs in later times, he, with the help of this argument, comes to the conclusion that the buildings at Mycenæ and Tiryns must date from a late period. The boldness of such a proceeding is, indeed, to be wondered at. If Mr. Stillman had bestowed a closer examination on the well-known buildings of the Heroic age (*e.g.*, the Lions' Gate and the dome-shaped sepulchres of Mycenæ, and the treasury of Minyas at Orchomenos), it could not have escaped him that the huge stone blocks of these buildings have nearly all been worked with the stone saw, many of them with the tubular drill. And these instruments he pretends to be a later invention. I am at any time ready to accompany Mr. Stillman and anybody else to Tiryns and Mycenæ, and to convince them there on the spot of the application of these instruments. Therefore, the material of the palace walls of Tiryns, the existence of the most archaic paintings on them, and the manner of the working of both antæ and doorsills, — all these items are so many proofs for the highest antiquity of the Palace of Tiryns. To the same age belong also the house walls before and behind the tomb-terrace at Mycenæ, for here have been preserved the same antæ and thresholds, and near them have been found fragments of similar wall-paintings; but the small cross walls between the tomb-terrace and Cyclopean outer walls belong to a later period, which I do not venture to determine. Besides these reasons, we can still furnish further the evidence for the remote antiquity of the Palace of Tiryns: (1) It cannot escape any one who examines the plan of Tiryns attentively, that there exists a narrow connexion between the outer Acropolis wall and the wall of the palace. The angles of the Acropolis wall correspond for the most part exactly to the walls of the palace. This connexion distinctly proves that (apart from some small later alterations) the palace has in its present shape been erected contemporaneously with the outer Acropolis wall. Nobody has ever doubted the high antiquity of the huge Cyclopean outer walls, and consequently the palace walls also belong to the same remote age. For the rest the masonry of the outer Cyclopean walls and the walls of the Palace are perfectly identical; both consist of almost unwrought limestones bonded with clay-mortar. The only difference is that in the outer walls the stones are of larger dimensions, because, as walls of defence, they had to give greater resistance to the assailants. (2) I can still adduce for the high antiquity of the Palace another evidence, which has hitherto not been sufficiently noticed. In the vestibule of the great men's hall we found on the left wall a frieze about 2 ft. high, consisting of alabaster, which is inlaid with small pieces of blue Egyptian glass (*κύανος*). I formerly believed on technical grounds that this frieze was not *in situ*; that it had originally stood at another place of the palace, and that it had later on been removed to the vestibule as ornament of the wall; what led me more than anything else to believe this was the circumstance that the frieze does not stand close to the wall, but that it is separated from its quarry-stone masonry by a layer of earth as thick as the hand. But having now, in company with Dr. Schliemann, minutely examined the Treasury of Orchomenos, and having found that the thalamos wall, which consists of quarry stones bonded with clay, is covered with perfectly identical relief slabs, I have to give up my former opinion, and I believe now for certain that the frieze of alabaster and kyanos is still standing in its original place in the vestibule of the Tirynthian palace. The relief slabs in Tiryns and Orchomenos not only consist of a very similar material and not only show kindred ornaments (spirals and rosettes), but both have also the circumstance in common that they are separated by a thick layer of earth from the quarry stone masonry behind them, and that they have an identical connexion with the squared antæ blocks. The existence of the alabaster frieze in the palace of Tiryns permits us to draw two important conclusions. (1) Similar friezes of alabaster have been found on the walls of most ancient palaces in Mesopotamia; our Tirynthian palace, therefore, resembles them, and this is an additional evidence of its high antiquity. (2) When formerly somebody wished to adduce a proof that the Homeric poems do not represent the reality, but that they are the offspring of a poet's imagination, the palace of Alcinous was pointed out as imaginatively described by Homer. According to Homer the walls of this palace were of bronze, the doors of silver; and all along on the wall was a frieze of kyanos, namely, of blue Egyptian glass. Now, it is known that traces of former metal covering have been found in the dome-shaped tombs; and if we also find in the royal palace of Tiryns a frieze of kyanos along the wall, can we then doubt that Homer describes only such royal palaces as really existed, and that Tiryns is such a palace? These are the most important proofs which I, as an architect, can lay before you to prove that the walls discovered at Tiryns are the remains of a pre-historic palace. Finally, there is still another proof, which, however, does not belong exclusively to the domain of the architect, for the philologist has a share in it; I mean the evidence that the plan of Tiryns has a striking resemblance to the plan of the king's house, such as it is depicted to us by Homer. I will not enter here on this evidence, for all I have to say in this respect is stated explicitly in the book "Tiryns." Permit me only a twofold observation. In the first place, Homer does not give a detailed description of the palaces of his heroes, but he makes occasional references to them; but the different references do not suffice for a trustworthy reconstruction of the Homeric palace, as is evident from the fact that the many plans which were formerly made thereof all differ essentially from each other. It is, therefore, a daring enterprise to prove that the Palace of Tiryns does not agree with the royal house of Homer, for this latter is in many points not an ascertained fact. In the second place, Homer speaks of the dwelling-houses of Ulysses, of Alcinous, of Menelaus, but he is silent on the palace of Tiryns. Now it may be taken for granted that in the main all heroic dwelling-houses agreed, but there are some differences of detail. Thus, for instance, the description of the murder of the suitors cannot be followed out in its circumstances without encountering some small difficulties. But in my opinion there do not exist any essential difficulties; for I think the agreement of the plan of Tiryns with the Homeric dwelling-house is beyond all doubt. You will agree with me that the technical evidences adduced by me are perfectly overwhelming, and that they repose on sure foundations. You will, I trust, also share my opinion that he who nevertheless still maintains that the Palace of Tiryns dates from Macedonian or even from Byzantine times, is bound to bring forward real counterproofs, and that it is not sufficient to write articles which are more personal than matter of fact. We are at all times ready for a discussion on the real points at issue; we much desire that every one may frankly express his doubts, for only in this way can we come nearer to the truth and advance science.

Mr. Stillman's Remarks.

The question, said Mr. Stillman in his paper (which was read for him by Mr. Pelham), which is involved, is, fortunately, one that does

not require or admit of much investigation, but must be answered by experience in the examination of ruins which can be, with tolerable certainty, attributed to the epoch in which Dr. Schliemann has placed his pre-historic palace. To be judged in any way, the ruins must be examined with care as to technique, and must be examined with a knowledge of wall-structure, especially of the pre-historic periods of the architecture of Greece and the islands. He made no pretension to be an expert in Greek architecture, but he had been able to substantiate the probable accuracy of traditions which attributed certain ruins to a civilisation which extended over the southern part of Italy, and which was known as Pelasgic or Cyclopean. That of that class of remains Tiryns was an example, there was some proof; certainly it was of that early date when the art of working in stone was in its very rudest phase. So far as he could judge, that class of remains included the ruins of Cephalonia, Cythera, Crete, the Troad, and almost all the work at Mycenæ and the cities of Alatri, Arpino, and others in Italy. Those remains showed no stones cut with edge tools, chisels, &c. In all that work there was no evidence of shaping other than by grinding one stone on another. In those examples which he had been able to examine with any degree of precision, there was nothing to show whether the drill used was a hard stone, such as that used for cutting gems. But at Tiryns he found stones, cut with a chisel apparently rather modern, and of excellent metallic make, and laid in mortar,—indications pointing to a comparatively modern date, say 500 B.C. There were found bases of columns, cut in a rude and slovenly style, and, as Tiryns was overthrown not far from that time, an undisturbed ruin like that would show something of that kind. The work of Dr. Schliemann was of a solid, deliberate, and painstaking character; but, while admitting that, he must point out that these walls were entirely unlike any pre-historic work he had seen, and he could see no other alternative than to come down to the hypothesis of a relapse into barbarism after the fall of some antecedent period of Greek civilisation. But there was nothing to indicate any occupation of Tiryns between Pausanias and the Argives. There was no indication of an occupation subsequent to the period to which the walls which Dr. Schliemann attributed to a prehistoric palace belonged, but there was the laying of parts of the walls on *débris*, which showed clearly that this was at least a second construction. Nor was there, as Dr. Schliemann held, a difference of character in different parts of the ruins, but only a difference of the more or less use made of stone found *in situ* and employed in the reconstruction. But there was distinct evidence of Byzantine occupation, and no evidence of anything between that and the destruction of the city. The better as well as the poorer parts of the walls contained the same evidences; holes cut with the drill, mortar and bricks. The only conclusion he could come to was that a Byzantine occupation took place after the destruction of Tiryns by the Argives. It must not be forgotten that a previous explorer had tried that site and had abandoned the work from its evidently non-antique character. Another early excavation of Dr. Schliemann was also abandoned for the same reason. He believed the hypothesis of a re-occupation of Tiryns in the Byzantine period would explain every detail, and that insuperable difficulties offered themselves to any other attribution.

Professor Middleton's Remarks.

Professor J. H. Middleton said that among the reasons which had been adduced why the remains found at Tiryns by Dr. Schliemann were not to be regarded as being of the extreme antiquity ascribed to them was, firstly, that the stones of the walls were small, and secondly, that they showed marks of various tools not generally believed to have been in use at the period assigned by Dr. Schliemann as the date of the wall. With regard to the first objection, the walls in question were themselves small, and it was, therefore, not possible to use very large stones in their construction. With regard to the second objection, all the tools which had been used seemed to be tools which were used in Egypt at a very early period. Such drills and saws as those which had been referred to had certainly been used in Egypt, in conjunction, probably, with sapphire dust or emery powder. In some of the Egyptian remains it could be seen with what rapidity similar tools had cut into the stone; the distance of cut at each stroke of the saw, and the quickness of the spiral formed by the drill, could be noted, and it was tolerably clear that such work could not have been done without the use of diamond-studded drills or without the aid of bort or corundum-powder. The use of drills of this kind for hard stone was of extreme antiquity. Mr. Flinders Petrie had shown that they were used in Egypt as early as the Sixth Dynasty. Another objection urged against the antiquity of the walls at Tiryns was that mortar was used. Dr. Dörpfeld had shown that that was not so, not that it would prove very much if it were so, for in the earliest stone buildings of Rome mortar was used for the joints, as, for example, in the Tullianum or Mamertine prison. The character of the painted wall-decorations, again, was decidedly in favour of the high antiquity ascribed to the remains by Dr. Schliemann. [In regard to this latter point, Professor Middleton particularly referred to the drawing (exhibited on the walls) of the scroll ornament, of which we gave a representation in connexion with our notice of the "Tiryns" volume in the *Builder* for November 14, 1885 (page 671), and which is certainly of a very archaic character.]

Dr. Schliemann in Reply.

Mr. Pelham and Mr. Lansdell having made a few remarks, a hearty vote of thanks was, on the motion of the chairman, accorded to the readers of papers, and Dr. Schliemann was called upon first to reply. He said that when, ten years ago, he discovered the walls at Tiryns, his first conclusion was that they were Byzantine, but subsequently he went down to the rock and found that the walls were pre-historic. He found also drains, as at Mycenæ, which were Cyclopean, and he found a perfect system of drains going from the brick bath-room. There is a slab there still, which weighed 23,000 kilogrammes (23 tons).

Dr. Dörpfeld in Reply.

Dr. Dörpfeld was next invited to reply. Speaking in German, he said that there were no kiln-burnt tiles whatever in the remains of the palace, and that any such tiles that had been found were in the walls of what was known as the Byzantine Church at the side, which, though near the Palace, had not been regarded by Dr. Schliemann or himself as forming any part of it. In regard to the use of the saw and the cylindrical borer, though none of the large stones in the fortifications of Tiryns showed the use of those tools, yet in the Lion Gate at Mycenæ, in the Treasure House at Orchomenos, and at Tiryns in the larger stones, the use of similar tools was shown, namely, of a saw employed probably with some material, such as corundum, and a cylindrical drill.

Mr. Penrose in Reply.

Mr. Penrose, on being invited to reply, said very few words would be necessary. He regretted the absence of Mr. Stillman, whose intelligent study of the question would have enabled him to throw great light on the matter, and he agreed that further discussion should be, as Dr. Schliemann and Dr. Dörpfeld had suggested, as far as possible carried out on the spot, and he hoped this would be done. He had looked at the walls, when there, with the greatest interest, as an architect, but he could not agree with Drs. Schliemann and Dörpfeld on certain points. He was surprised to hear that kiln-burnt bricks were only found in the church. His memory had served him ill if there were not such bricks in other parts. Dr. Schliemann attributed the burned bricks to a conflagration, but this contention he (Mr. Penrose) had already met with the opinion of an experienced brickmaker. He would like to ask Dr. Dörpfeld on what authority he said that Vitruvius spoke of sun-dried bricks? He understood the reference of Vitruvius to be to bricks as used by the Romans. He apprehended that the term "burnt bricks" would be used in the sense that Vitruvius employed the term *lateres*. They could not, in that company, expect to get to the bottom of the question, but the discussion had served a useful purpose, and one or two instructive points might be extracted. Whatever might be the differences of opinion with regard to the points at issue, they must all be gratified at an enterprise which, whatever the issue of the present discussion, must always reflect the greatest credit upon Dr. Schliemann and upon Dr. Dörpfeld, his coadjutor.

Mr. Karl Blind, having said a few words in reference to the late Mr. Fergusson's endorsement of Dr. Schliemann's estimate of the antiquity of the remains found at Tiryns,

Prof. C. T. Newton, C.B., moved a vote of thanks to the chairman, and the proceedings terminated.

KINGSBURY CHURCH.

SITUATED in the heart of a charming bit of natural scenery is the small but interesting church of Kingsbury, dedicated to St. Andrew. It is nearly a mile and a quarter distant from the Neasdon Station, on the Metropolitan Railway, and about four miles east of Harrow-on-the-Hill. The walk to the church from the station is through a pleasant winding lane, crossing the Brent by a temporary wooden bridge, which has done duty since the old one was destroyed by the flooding of the river a few years since.

A neat little school-house, by the river's edge, has also been recently erected, and would really be effective did not the bell-cote, &c., display too prominently the fussy desire of its designer to exhibit his technical skill in timber-framing.

Passing the schools and ascending the hill beyond the river, until some farm-buildings are reached; then turning to the right, and passing through a lovely lane, skirted by spreading elms, the ancient fane (a glimpse of the small spire being seen between the trees) is at last found, almost hidden away among the abounding foliage.

Climbing over a stile, you find yourself in a churchyard, sylvan in the highest degree; trees and shrubs, shrubs and trees, confront you on all sides. Many of the tombs are secluded and have to be sought out. William, third Earl of Mansfield, who died in 1840, lies here; also the Earl of Orford.

"Chingesberie," as it is written in the Domesday Survey, or "Kyngesbyrig," as it appears in a deed of gift of Edward the Confessor, has no doubt an unwritten history far more remote than that of the invasion of the Norman conquerors. Dr. Stukeley seems very certain that Kingsbury was a Roman station, and that Julius Cæsar formed a camp or prætorium on the spot after crossing the Thames.

Before the Norman Survey there appear to have been two manors, Edgware and Kingsbury, the latter only being mentioned in Domesday.

This ancient record states that one Albold held a manor in Chingesberie of Ernulf de Hesding, containing seven and a half hides of land. A mill is also mentioned, the rent of which was three shillings; also a meadow and wood for 1,000 hogs, the value of which altogether amounted to 4*l*. In Edward's reign it was valued at 6*l*.

Edward the Confessor presented Kingsbury by royal charter to the Abbey of Westminster. It then contained two hides and a half of land.

For 300 years there appear to be few records, and little is known of Kingsbury until the reign of Edward II., when, in 1317, the manor became the property of one Baldwin Poleyn. From Poleyn it passed in 1329 to Walter de Galinge, who left three daughters co-heirs.

Thomas, Earl of Lancaster, became lord of the Manors of Edgware and Kingsbury by marriage with the daughter and heir of Henry de Lacy, Earl of Lincoln; and Lestrange, who married his widow, died in 1335 seised of the manor of Edgware and hamlet of Kingsbury. Thomas Chichele with others purchased the manor in 1439 as trustees for All Souls' College, Oxford.

At the Dissolution, Henry VIII. granted the manor and rectory to the Dean and Chapter of St. Paul's. In 1547 the valuation stood at 16*l*. 16s. 8d., and had increased enormously during the next hundred years, when, in 1650, it was valued at 170*l*.

By the terms of a lease of the manor and rectory granted to Guthlac Overton by the Priory of St. John of Jerusalem in 1525, for sixty years, it was covenanted that the lessee "is to find a fit chaplain for the cure of the church, and to keep the chancel in repair."

From the appropriation of the rectory the church became a donative or curacy. Kingsbury is one of the few churches not included in the taxation of Pope Nicholas, 1291.

The parish register does not go back further than the year 1733.

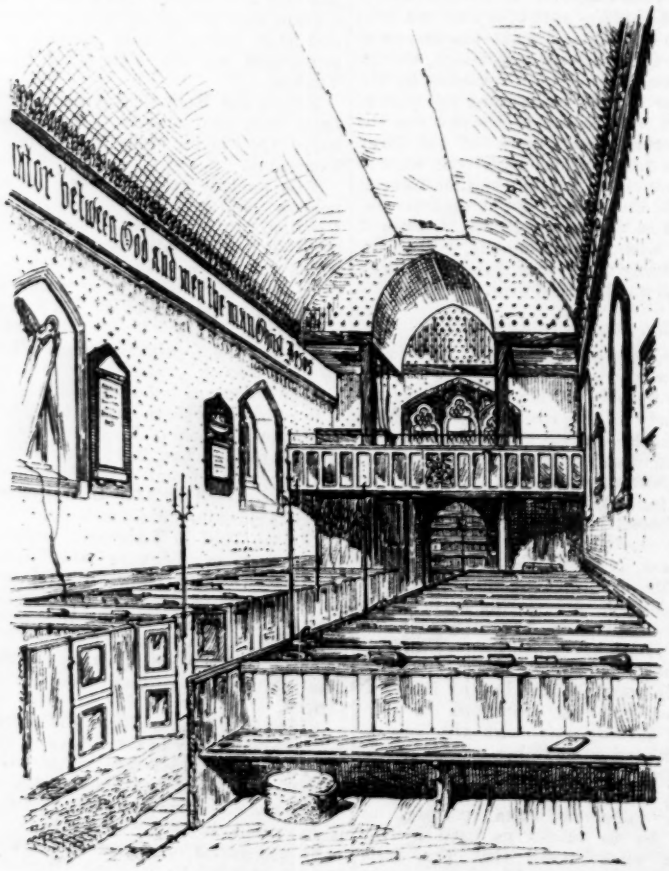
The date of the foundation of the church is unknown. The few remains of architectural features, namely, the windows as we now see them, were probably inserted at a time when the property was made over to the trustees of All Souls' College, when the whole of the fabric may have gone through repair.

Kingsbury Church.—Exterior View.

The porch, which stood on the south side, near the west end, until 1830, was of timber, and in an engraving of the church, published in 1807, where the porch is distinctly shown, it would appear to be contemporary with the windows; the sides are divided into four panels by mullions, the tracery being pierced with quatrefoils.

Why this porch was taken down it is hard to say, as it must have formed a suitable and convenient approach to the interior of the church, which it is now wanting.

The plan of the church is a parallelogram, 58 ft. by 18 ft. 3 in. internal measurement, no break or division separating the nave from the chancel, neither are there any aisles. The vestry, situated at the south-east corner, is of no archæological value whatever, being quite modern, and the walls built of common bricks. This is not so with the main walls of the church, as they are the most interesting feature of the building, and where examination permits (for the walls are coated with rough-cast, and it is only at the exposed portions that the construction may be seen) they appear to be built with flints of large size, roughly squared on the face, mixed up and bonded irregularly with red Roman bricks or tiles, of the usual thickness, or, rather, thinness, giving evidence of a previous building standing here. The mortar does not appear to be so tenacious as may be found in many remains, especially of the Saxon period, less lime having been used; but, however this may be, in respect of the work remaining unexposed, the walls are undoubtedly sound and substantial. The exposed north-east angle shows quoins of squared freestone.



Kingsbury Church.—Interior View.

The walls are pierced by eight windows, three being on the north and south sides respectively, and one is placed at each end. There is also a small window-opening at the north-west corner.

The tracery is of the Perpendicular era in its early days, much decayed and fallen away. No two windows are alike in detail, although uniform in size and effect. The roof, which is high-pitched, is covered with tiles. Internally the timbers are at present hidden by a plaster coved ceiling, flat in the centre, but no doubt it was originally open.

Rising from the roof, at the west end, is the belfry, containing three bells. It is of timber construction, in the village carpenter style, but by no means bad.

The largest bell is inscribed,—

"Lever . Jackson . Churchwardens.
Made by . Sm . Newton . 1708."

The second has the following,—

"God save King James F+H+B anno Domini 1604."

And the oldest bell has,—

"+ Petrvs : de : Westmo : me : fecit."

Whether the latter inscription refers to the Abbey of St. Peter, Westminster, with which it has been shown this church was connected, or relates solely to the founder's name, is matter for conjecture.

The belfry is reached by creeping through a trap-door in the ceiling situated over a gallery, the latter obstructing the interior. The less said about this piece of joinery the better.

The gallery has the merit, however, of hiding to some extent the thick posts that spring from the floor to the roof to support the belfry, which would otherwise have a very obtrusive appearance.

The window openings have on the interior a modern reeded architrave with corner blocks, quite "Soanean." The glazing of some of the windows is in quarrels with glaring pot metals; others are filled in with stained paper, the whole unworthy the place.

The church possesses three monumental brasses. That to the memory of John Shephard,

pray for the soules of John Shepard Anne & Mawde
his wyfes whiche John deceased the xv day of Aprill
the yere of o' lord m b xx on whose soules ihū have mercy

Brasses, Kingsbury Church.

who died in 1520, his two wives, viz., Anne, with seven sons and three daughters, and Maude, with five sons and three daughters, is on the north wall at the eastern end. Near to it is a smaller brass, date 1607, bearing the following inscription:—

"Svsan late wyfe of Thomas Gawen and
Davghter of Thomas Scvdamore by Francis Borne
Lyes bvryed heare, by death's vnpartiall hand.
Reft from her dearest frends, they left to movrne
Their losse of her who was throvgh all her life
A loyall davghter and a loving wife.
She died A Dni. 1607."

Attached to the south wall, opposite, is a similar incised brass, with the words:—

"Here lyeth the body of Thomas Sevdamore gent. servant vnto Qveene Elizabeth & Ke James 47 yeares who had two wifes Svsan and Francis and had issve by them 6 sonnes & 5 davghters and changed this life in the feare of God the 10 daye of September 1626 being of the age of lxxvii yeares."

There are eight marble tablets on the interior walls of the church; that on the north side, beginning at the east end, is "to the memory of William, third Earl of Mansfield, born March 7, 1777; died February 18, 1840; and Lady Cecilia Sarah Murray, fifth daughter, whose remains are deposited in a vault in this churchyard." The adjoining monument is to other members of Lord Mansfield's family. The next tablet is inscribed "Isabella Caroline, Lady Vernon, wife of fifth Lord Vernon, and eldest daughter of Cuthbert Ellison, Esq." The westernmost tablet, on the north, commemorates a sad event, which must have caused extended sorrow and sympathy at the time of its occurrence: "Sacred to the memory of Charles Radclyffe, aged 31 years; Alexander Henry, aged 10 years; William George, aged 17 years; and Edward, aged 15 years; four of the sons of Alexander Radclyffe Sidebottom, Esquire, who were drowned in the reservoir near this church on the 14th of August, 1835."

On the south side there is a tablet to Joseph Maile, "late of the New-road, St. Pancras," and his wife. Another to "John Tebbs, Esq., late of Jermyn-street, and eldest son of Sir Benjamin Tebbs, Knight." There is another tablet to the Tebbs family, and the last is to Mr. John Field, "of Oxford-street, Marylebone, and Kingsbury Green," and family.

The font, placed on the north side, is of no historic value. It is made of artificial stone or cement, and is of the ordinary octagonal panelled regulation pattern; not so, however, with the original and ancient one, which is placed in the grounds of a gentleman's residence in the neighbourhood. This font is simply a circular bowl, the upper portion being octagonal, well worn, and bearing evidence of its antiquity.

We subjoin sketches of the exterior and interior as at present existing, and of one of the Shephard brass. The church is, we believe, to be "restored." How much this means we do not know, but we hope it will be treated with reserve, and as little touched as possible,—on the exterior, at all events.

THE SCULPTURED SLABS IN THE SOUTH AISLE OF THE CHOIR OF CHICHESTER CATHEDRAL.

IN a paper recently read at a meeting of the British Archæological Association by Mr. W. de Gray Birch, F.S.A., the author states:—The Rev. Prebendary Stephens, in his "Memorials of the South Saxon See and Cathedral Church of Chichester," 1876, p. 31, gives two photographs of these sculptures, very much reduced; but his account of them is unsatisfactory. He writes of the primæval see at Selsey:—"The present village is two miles distant from what was the old parish church, and the nave of it was, therefore, taken down a few years ago and rebuilt in the village, stone for stone, with a new chancel. The old forsaken chancel, however, is still used for burials and baptisms, and the extremely far older font may fairly be coeval with the removal of the see to Chichester, and, therefore, may have probably stood in the ancient cathedral of Selsey. Relics, treasures, and works of art were, no doubt, for the most part removed to Chichester when the bishop's throne was transplanted there. Among those we may, perhaps, venture to include the quaint, rude, yet forcible pieces of sculpture, representing 'The Raising of Lazarus,' of which an illustration is subjoined. They were discovered in 1829, behind the stalls of the choir in the present cathedral. Not improbably they had been concealed there to escape the soldiers of Waller, who, during the siege of Chichester in 1643, made havoc of the cathedral monuments with their pikes and pole-axes." This is all that Stephens states, and, insufficient as it is, it appears to have directed all subsequent ideas as to the origin of the sculptors under notice. Indeed the sculptures themselves have never received the attention they deserve at the hands of church antiquaries.

1. The first *tableau* only has a cresting of carved foliage, arranged in semicircular cusps of a clearly twelfth-century style. The moulding or carved plinth running round the base of the font in St. Nicholas's Church, in the scene which illustrates the "Baptism of our Lord," by St. John the Baptist, has much detail in common with this cresting on the sculptured slab; and I am inclined to attribute them both to the middle, or at best the early part of the twelfth century. The Ven. Archdeacon Hannah, Vicar of Brighton, in his paper on this font, printed in the March *Journal* of the Association for this year, thinks that this font "cannot be far removed from the date of the Conquest"; but I fear he has slightly exceeded the furthest limit which I would venture to assign to it.* English sculpture at the time of the Conquest was for all intents and purposes Saxon, and Saxon feeling remained dominant for years afterwards, both in sculpture and drawing. Architectural constructions and details were the first to succumb to the Norman influences, and sculpture followed (no doubt) not long afterwards. But there is not the least Saxon feeling in the font. However, to return, after this parenthesis, I will proceed with the description of the first picture. On the left is a castellated structure, with round-headed arch or portal, or engaged shafts with foliated capitals; the valve-doors are thrown wide open, and show ornamental metal hinges. The first story of this castle-like edifice is enriched with an arcade of round-headed arches; over this is an overhanging story with battlemented masonry, topped with three conical towers striated to represent thatch or shingle, and finished with an ample knob. This peculiar style of finishing off the conical roofs of turrets with a knob is frequently seen on seals of the twelfth century, as, for example, those of Canterbury Cathedral, engraved in Dugdale's *Monasticon Anglicanum*, vol. i.; Battle Abbey; Leeds Priory, Kent; Chertsey Abbey, Surrey; and others well known to students of seals. It may be noticed also in the building behind the Virgin, on the painted wall of the crypt at Canterbury, which is of the twelfth century. Martha and Mary are at the gate, one standing, the other kneeling, with hands clasped and uplifted in supplication. Their sleeves and the flowing skirts of their dresses are not far removed from the Saxon style of vestments. We may compare the dress of St. Pega in the twelfth century Guthlac Roll, in the British Museum (Harley Collections, Y. 6), where she is about to enter into a boat.

The figure of our Lord, a man of colossal proportions, occupies the centre of the subject, with cruciformed nimbus, long hair, and curled beard, book in the left hand, and a flowing robe, reaching to the feet. The right hand is wanting, but the right hand of the Lord's figure on the second picture appears to belong to this one, and I have so placed it in my suggested arrangement. The position of this hand in the second picture is out of symmetry with the attitude of the body. Behind the Lord are four disciples, in two tiers of two each, standing on the peculiar hillocky or hummocky ground, which is so characteristic of eleventh and twelfth century art. They form a balance to the two women on the left. These figures have the nimbus plain; the head of one is wanting, but the heads of the other three clearly indicate the excellent skill of the artist in rendering the various emotions of astonishment and grief. The hair is treated differently in every instance. From the depressed cavities of the eyes it has been suggested (I believe) that the eyes themselves were formed of glass or precious stones introduced into the sockets, and there is a slight evidence of this in one instance. The treatment of the eye by ancient sculptors has never been satisfactorily explained, and I am not a sculptor that I should essay to explain it. We see in the rudest sculptures—as, for example, the Easter Island idols under the portico of the British Museum, in the first statues of Greece, in the busts of the Roman period, and in Mediæval and modern sculptors' work,—that, while for all other parts of the body, concavity is rendered by concavity, and convexity by convexity, yet the markedly convex eye is reproduced by a concave depression. Why this is so I am unable to say. This panel, just as the other, is not now composed of a single slab of stone; whether it was so originally I do not know, but on looking at the photographs, it is clear that it consists of six horizontal courses. The first runs along the arcade over the doorway, under the Lord's neck, and through the lower nimbus of the two lower disciples. The second can be seen running through the book held by our Saviour; the third, across the shoulder of the standing woman; the fourth, along the arm of the kneeling woman; the fifth line, at the end of the carved moulding of the right-hand column of the doorway. We may compare the way in which the round-headed arches of the external arcading on the north wall of the chancel of the Saxon chapel at Bradford-on-Avon have been carved on rectangular slabs of stone, regardless of the position of the joints.

Besides these six horizontal courses of ashlar work (if the term may be appropriately attributed to this system of building up a composite slab, which was afterwards covered with its intended relief by the sculptor), there are numerous vertical joints and fragmentary cracks which show themselves. Some of these have been badly put together, either at the time of the discovery behind the stalls of the choir in 1829, as related by Mr. Stephens in the preceding extract, or at a more remote period. There is no record, so far as I know, of the state (whether broken up or united) of these slabs at the date mentioned, nor of the condition of the back at the time when they were let into the wall which they now adorn. I venture to suggest that the drapery of the left arm of the standing figure of the Apostle on the left side of the second slab belongs to the right arm of our Lord in this first panel, and the hand of blessing, with the first two fingers extended, the last two closed, which stands now in the second slab, belongs to the right hand of our Lord in the first slab. The drapery of our Lord and the Apostles composing the two lowest courses in the first slab is wrongly united, and in some cases the original stone has been pared down by the mason who put up the slabs in their present state, and made up deficiencies with cement. The folds and plaits do not altogether coincide, and the advanced foot of our Lord, with the curled-up kind of ground below it, seems to belong more appropriately to the other or left leg in the second panel. If these pieces are taken out by an experienced mason, and the cement or mortar which has been used in bedding them into the wall carefully removed, the original lines of fracture will be revealed, and the disjointed pieces can be reinstated into their pristine and proper places, to the evident and manifest amelioration of the slab. A plate-glass front ought to be placed before this and the second slab to protect them from dust, weather, and dirty fingers. This could easily be effected in the same way as the Babylonian slabs have been treated in the British Museum.

II.—The second slab is of the same dimensions, and from the hand of the same artist, as the first. It also exhibits equally clearly the six horizontal courses of stone work. The first joint runs along the neck of the Lord; the second, through the lower part of the book which he holds; the third, where the cut break in the dress of the Lord is seen; the fourth, just below the uppermost hands of the two gravediggers; the last, where the break in the dresses, on the right hand side, is seen. This slab represents "The Raising of Lazarus," and when complete, and correctly put together in the way suggested, it becomes perfectly intelligible. No doubt many MSS. at the British Museum in Oxford and Cambridge, and such works as treat of Early Christian art, would furnish examples to show that we have here a purely conventional picture in stone relief, designed after a manner perfectly intelligible, and requiring no strained or mystical explanation with which some have sought to invest it.

It has, indeed, been sadly disfigured by the misplacement of most of the pieces of the four lower courses, which has resulted in joining the head and upper trunk of Lazarus to the left arm and hand of a disciple; and by way of balance, I suppose, the lower part of the bandage-wrapped, mummy-like body of Lazarus has been surmounted with the head and neck of one of the three assistants who are helping to extricate him from the tomb. This incongruous medley has not been easily carried out, and the result is that two Lazaruses are made, and there are a hand and arm without visible junction to any other limb. Besides this, the confusion made with the dresses of all the figures is very considerable. I am told that some mystical

* Mr. J. R. Allen speaks of these slabs as of "perhaps Saxon date" in a recent paper on Norman sculptures read before the Society of Antiquaries of Scotland, p. 421.

explanation has been suggested; that the two pseudo Lazaruses are,—(1), the rising Lazarus, half way out of the grave; (2), the unwrapped Lazarus, naked to the waist, raising his arms in grateful adoration of his Redeemer, representing a second stage in the action, and upheld by a hand and arm which have been added with no other motive than to signify the wonder-working might of the Saviour, and to give a practical turn to the beautiful verse, "Underneath are the everlasting arms," worthy of the artist who drew the pictures of the Albrecht Psalter. We know, of course, how often the Virgin bearing the Child in her arms is depicted in the same picture with the adult Christ; and it appeared no more incongruous to do this in the sixteenth than in the tenth century. But that is a peculiar case, and the Child had become, even at a far earlier date than the tenth century, an almost inseparable ideographic emblem of the Virgin.

If the pieces, however, can be loosened and re-arranged in the order suggested by Mr. Birch, then will the two Lazaruses rightly become one again, and the disconnected hand and arm re-unite with the head and body of the attendant to which they belong. The drapery of the skirts is here, as it was in the former slab, unsatisfactorily joined together, of the Lord especially; but it would require the removal of the cement and mortar which have been filled into the grooves, in a vain attempt to hide the want of continuity in the folds and lines, before the whole puzzle can be solved.

There can be no doubt that if the parts which are manifestly wrong in position are taken out, the whole can be re-arranged without difficulty, and the result cannot fail to satisfy every one who cares to compare the present with the suggested arrangement of the sculptures. Beautiful to the archæologist as these *alti-relievi* are even now, in their disconnected and, in so far, sadly marred condition, they would unfailingly become tenfold more beautiful and important in their new arrangement; and those who now perceive the misleading condition of these ancient sculptures, may not only rejoice in seeing a blemish removed, but in contemplating two stone slabs sculptured by English hands with elaborate representations of Christian antiquities such as may be sought for in vain in any other ecclesiastical edifice in England.

Illustrations.

FAREHAM CHURCH, HANTS.

THE circumstances under which this design has been made will be best understood by the following report of the architect, Mr. A. W. Blomfield, on the existing church, the plan of which is appended to the drawing, along with the plan of the new church, incorporating a portion of the old:—

"November, 1885.

The parish church of Fareham, dedicated to SS. Peter and Paul, consists of a huge square building forming the nave or body, from the north-east corner of which extends a long and narrow chancel.

The tower stands on the north side at the same angle, and a vestry projects from the east side of the nave.

The records of the architectural history of the church appear to be few and meagre.

All that now remains of the original structure is the chancel, an interesting and characteristic relic well worthy of careful preservation.

The tower, erected in 1742, although unattractive in appearance, is solid and well built, and is not inconveniently placed.

The nave or body of the church, put up about 1812–14, has nothing whatever to recommend it except its great size and the number of sittings (said to be 1,400), a large proportion of which are placed in the enormous galleries which surround three sides of the building.

Any attempt at mere alteration or improvement here would be an absolute waste of money, and if anything is done on the present site the entire demolition and rebuilding of this part of the church must form an essential feature of the completed plan.

There are several good reasons for rebuilding on the present site rather than on a new one.

1. The associations surrounding the old church and the old churchyard are worth preserving if possible.

2. The total necessary outlay to complete a satisfactory church here would be considerably less than that required to build an entirely new church elsewhere.

3. The work (as I shall presently show) may here be done by instalments, so that a start may be made and an effective enlargement and improvement may be carried out at a moderate cost; while, on the other hand, if a new church were built on a new site, the whole would have to be finished before the congregation could be transferred from the old to the new building, and a beginning could not well be made until the greater part if not all the funds required for completion were collected.

4. The most important part of the work could be done without touching the present nave or interfering with the services.

The only objection I know to rebuilding on the present site is the interference with graves; but this would not be as serious as might at first be supposed, and it is a thing that has very often to be done.

I have prepared a sketch-plan (sent herewith) showing in a general way the form which the new church ought to take if such a scheme were adopted.

The tower would be retained, and the present chancel would become the north aisle of a new chancel.

Although the church would not nominally hold so many as at present owing to the absence of galleries, it would be quite as large as it ought to be, and on special occasions a considerable additional number might be accommodated by the use of chairs without excessive crowding.

If some such plan as this were adopted, a beginning might be made by the erection of a new chancel, with or without the organ transept and vestries, according to the available funds. This part of the work might (as I have already said) be carried out without disturbing the body of the church or stopping the services, and when complete and opened out it would be a large addition and great improvement to the church. Some of the galleries might then be removed and the nave might be refitted with new open seats of such lengths as would suit the future nave and aisles.

The reconstruction of this part of the church might thus in case of need be indefinitely postponed without any practical inconvenience.

The last work would be the raising of the tower and casing it so as to bring it into harmony with the new church. This, though not absolutely necessary, would probably not long be left undone.

In carrying out a scheme of this kind every precaution would, of course, be taken to secure respect for the remains and memorials of the dead. The floor of the church would be raised and concreted all over, and a proper scheme for warming would be adopted.

Plans and estimates may be prepared for the whole work, divided into as many sections as may be desired.

ARTHUR W. BLOMFIELD."

In regard to the new design Mr. Blomfield adds the following comments:—"The drawings have been made with a view of providing as large an amount of accommodation as seems compatible with the preservation of all portions of the present building worthy or capable of retention.

The simple Early English character of the old chancel has suggested the adoption of that style for the new nave, south aisle, chancel, and organ-chamber.

The first north aisle is treated in the style of the flowing Decorated Period, and the second in that of the Perpendicular or latest development of English Mediæval architecture, which has also been adopted for the Vestry.

This variety has been made partly because these styles admit of flat roofs, which for many reasons are desirable where I have indicated them, and partly because the very large windows which will be absolutely necessary to light this part of the church properly are characteristic of them.

The tower would be cased with flint and stone, and the lower parts treated as very simple Norman, the upper stages and spire being Early English.

I think that in a work of this kind the adoption of different styles in different parts is not only admissible, but that it will add an interest to the building.

The church thus treated will, in my opinion, be effective and satisfactory, both externally and internally.

I should propose to use flints or sea pebbles, and Bath or Doulting stone outside, Bath stone and Fareham brick inside. The roofs would be of fir and covered with tiles.

I estimate the cost of the work at 10,000*l*., exclusive of the upper part of the tower and spire."

ALL SAINTS' (R.C.) CHURCH, WARLEY.

THIS church is built upon a narrow piece of land abutting upon the high road from Brentwood to Great Warley, Essex. It is near to the entrance to Warley Barracks, and is intended mainly for the use of the Catholic soldiers in garrison there.

The walls externally are faced with Kentish rag stone, with hard Ancaster stone dressings. Bath stone is used for the columns, arches, vaulting, &c., inside. Gregory's wood-block flooring is laid in the nave and aisles.

Messrs. Lathey Bros. carried out the work, from the designs of the architect, Mr. F. W. Tasker.

NEW RESIDENCE, S.J., FARM STREET.

WE illustrate this week the original design made by the architects for the new residence of the Jesuit Fathers, at Farm-street, W.

The desire of the architects was to work up to and embody the style of the church and the beautiful side porch as far as possible, which were already in existence, and to face the building with stone, but with as little detail as the elaborate existing work would admit of to be consistent with it.

It was also proposed to make use of the handsome side porch as the principal outer entrance to the residence, as well as affording private access to the church.

Subsequently, other plans were made and realised, with a separate side porch or vestibule, so curtailing the interior accommodation on the ground-floor, as the site at disposal was very limited indeed. These changes, together with the necessity of meeting further special requirements, have added considerably to the height of the building, which has an elevation in brick, very nearly as plain and as flat as it could be designed. Messrs. Goldie, Child, & Goldie are the architects.

HOLLOWAY COLLEGE.

WE give two further views of this important building, for description and remarks on which see the *Builder* for June 26 and July 3. The views now given, as well as those which we published last week, are from photographs by Mr. Vernon Heath.

CARMELITE MONASTERY, KENSINGTON.

THIS building, which is about to be erected, will be situated on a site in the rear of the well-known church of the Carmelite Fathers, in Church-street, Kensington.

It is to be placed on the north of the site, thus affording easy communication with the existing church and old house, while securing for the inmates as much privacy as possible, and a garden to the south, with a direct entrance from a side street to the west.

The rooms will all face the south. The building consists of five stories. The basement contains extensive and well-lighted offices. The ground-floor consists of two parlours, large kitchen, servery, refectory, 20 ft. by 40 ft.; common room, and principal staircase. There is also another staircase at the west end of the building for the part reserved to the noviciate. First, second, and third floors afford accommodation for the noviciate, and the cells of the religious. All the bath-rooms, lavatories, &c., are to be outside of the building to the north of the corridors.

The materials to be used are, for general facing, washed stocks, with Ancaster stone for dressings, the roofs to be covered with green slates. A great part of the basement and the walls of the kitchen, servery, and lavatories on all floors are to be lined with glazed bricks. The ground-floor is to be fireproof, laid with wood-block flooring, with the exception of the kitchen, servery, and border to main corridor, and the lavatories throughout, which are to be laid with red tiles. All internal jambs to doors and windows on ground-floor, and where necessary elsewhere, as also all arches, are to be executed in Beer stone. Wood panelling 5 ft. high is to be carried round the refectory, common room, large noviciate room, and oratory.

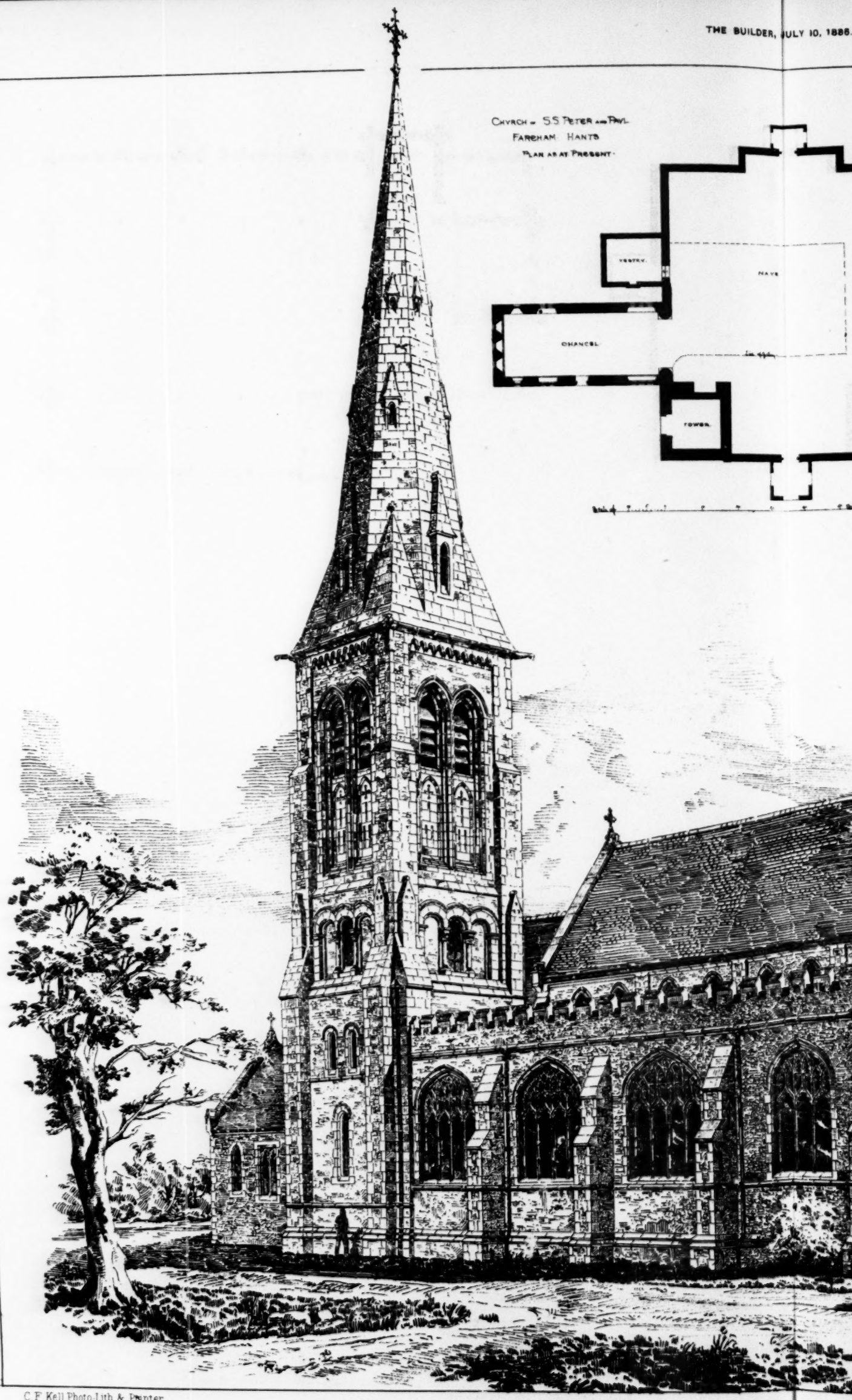
At a future time it is proposed to continue the ground-floor corridor as a cloister round the garden to the south, and also to build a wing containing library, chapter-room, &c., and additional cells.

This new building will be in direct communication with the sacristy and church on the ground-floor, and with the choir from the first floor.

The drawing from which the illustration is taken is hung in the Architectural Room at the Royal Academy (No. 1,691). Messrs. Goldie, Child, & Goldie are the architects.

Wolverhampton.—At the meeting of the Wolverhampton School Board on the 2nd inst. the General Purposes Committee recommended that, subject to the consent of the Education Department, the amended plans prepared by Mr. T. H. Fleeming, architect, for the enlargement and improvement of the Dudley-road Board Schools, be adopted. The chairman moved the adoption of this part of the report, and remarked that the proposed alteration would afford increased accommodation for 352 children, and the schools would accommodate altogether 930 children. The alterations would cost about 1,500*l*., exclusive of furnishing and fittings, which would amount to between 200*l*. and 300*l*. The recommendation was adopted.

CHURCH OF S.S PETER AND PAUL
FAREHAM HANTS
PLAN AS AT PRESENT.



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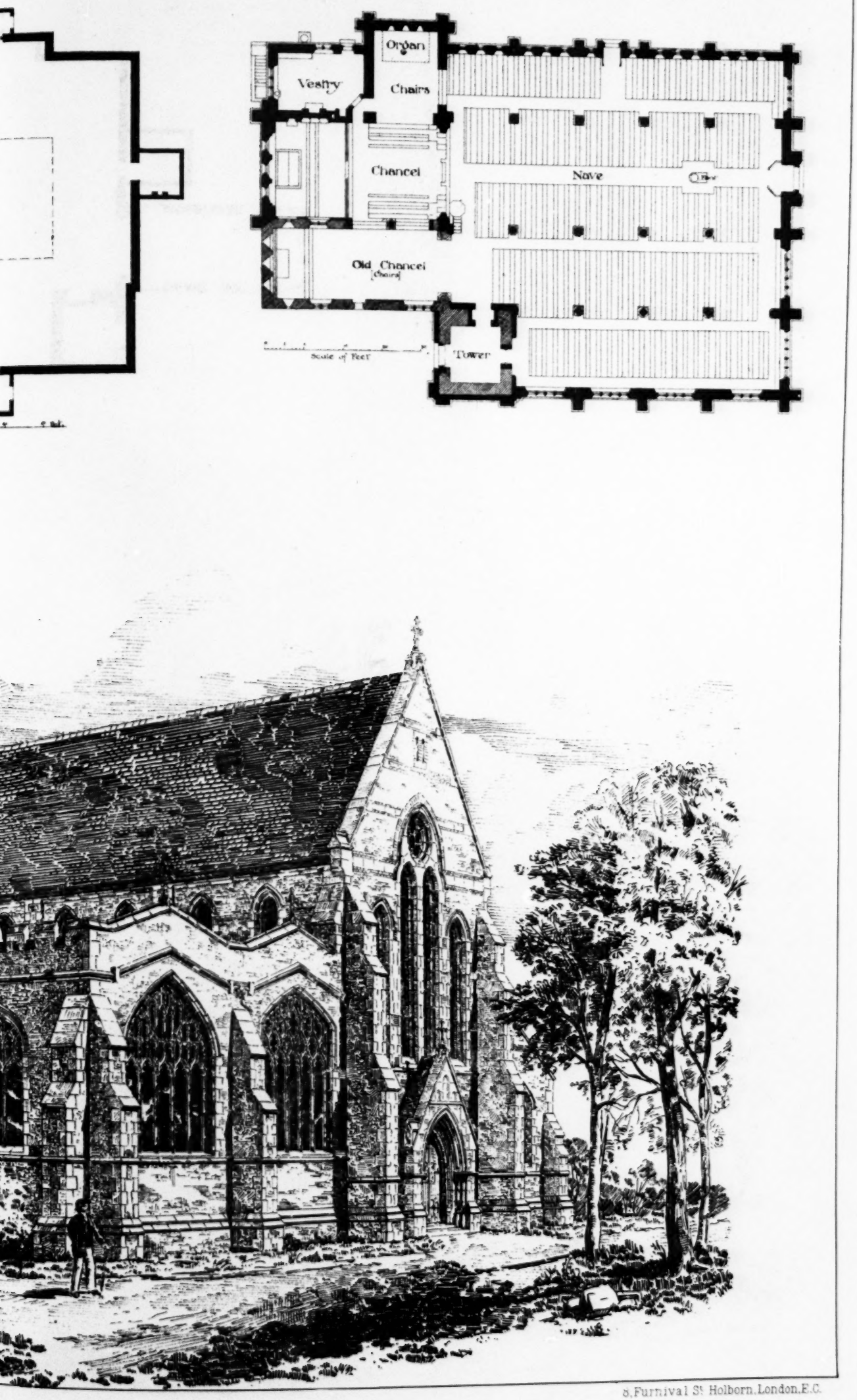
CHURCH OF SS. PETER AND PAUL, FAREHAM, HAN



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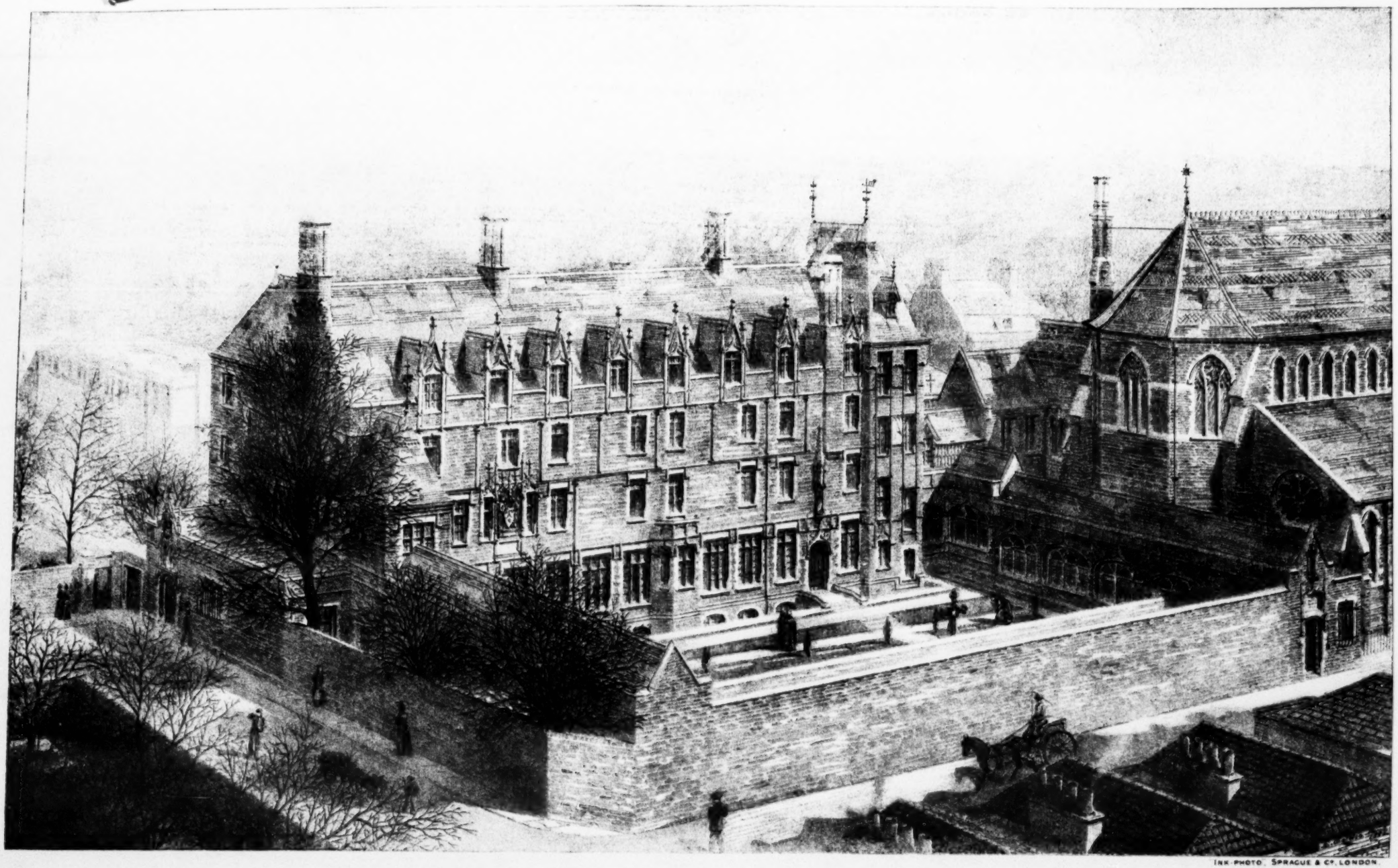
HANTS. MR. A. W. BLOMFIELD, M.A., ARCHITECT.



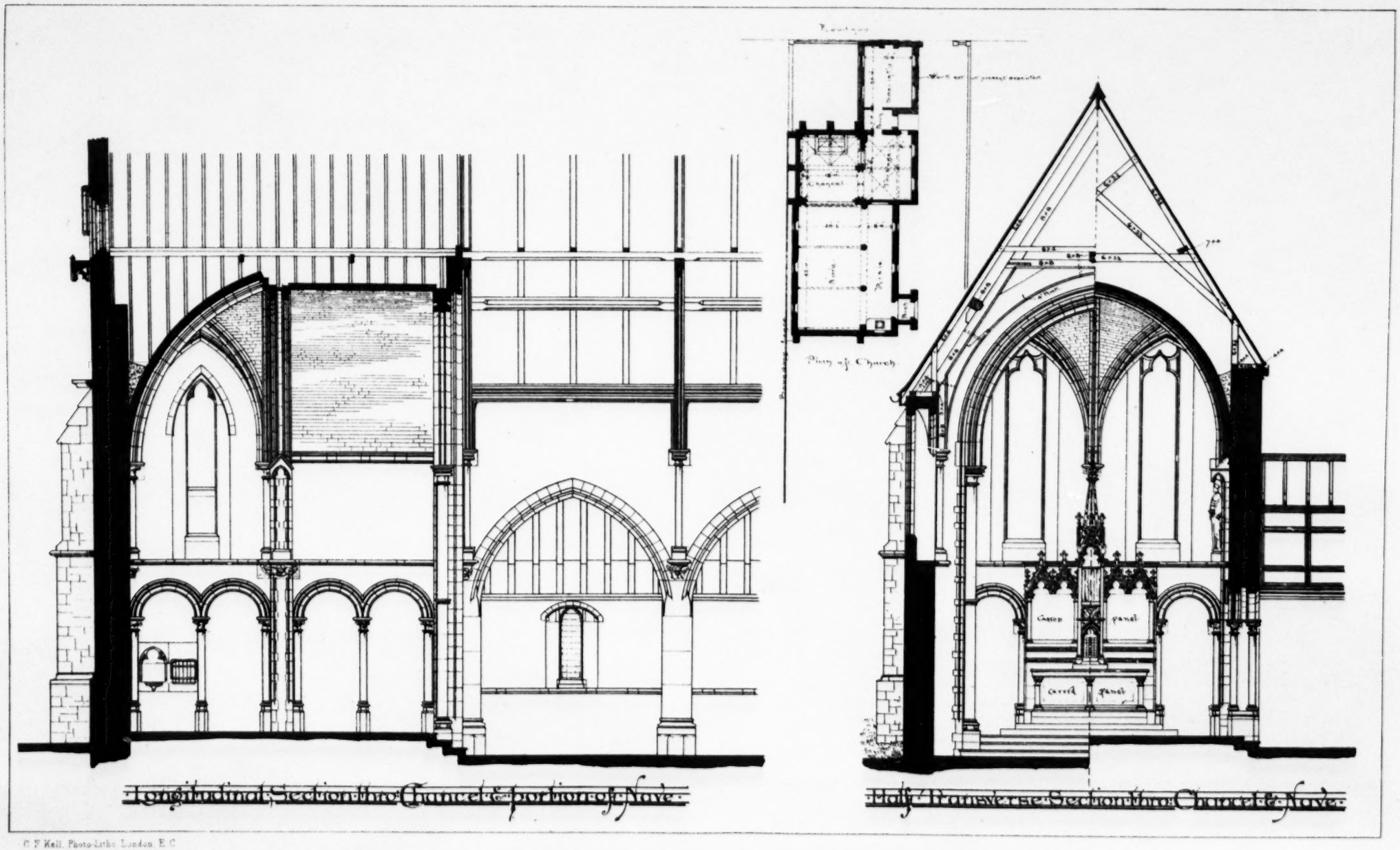
INK-PHOTO, SPRAGUE & Co. LONDON.

THE NEW CARMELITE MONASTERY, KENSINGTON.—MESSRS. GOLDIE, CHILD AND GOLDIE, ARCHITECTS.

"TRIK-PHOTO," SPRAGUE & CO. 28, MARTINS LANE, CANNON ST., LONDON, E.C.

HOLLOWAY COLLEGE, EGHAM.—Mr. W. H. Crossland, F.R.I.B.A., Architect.

THE SOUTH EAST QUADRANGLE AND CENTRAL OCTAGON.

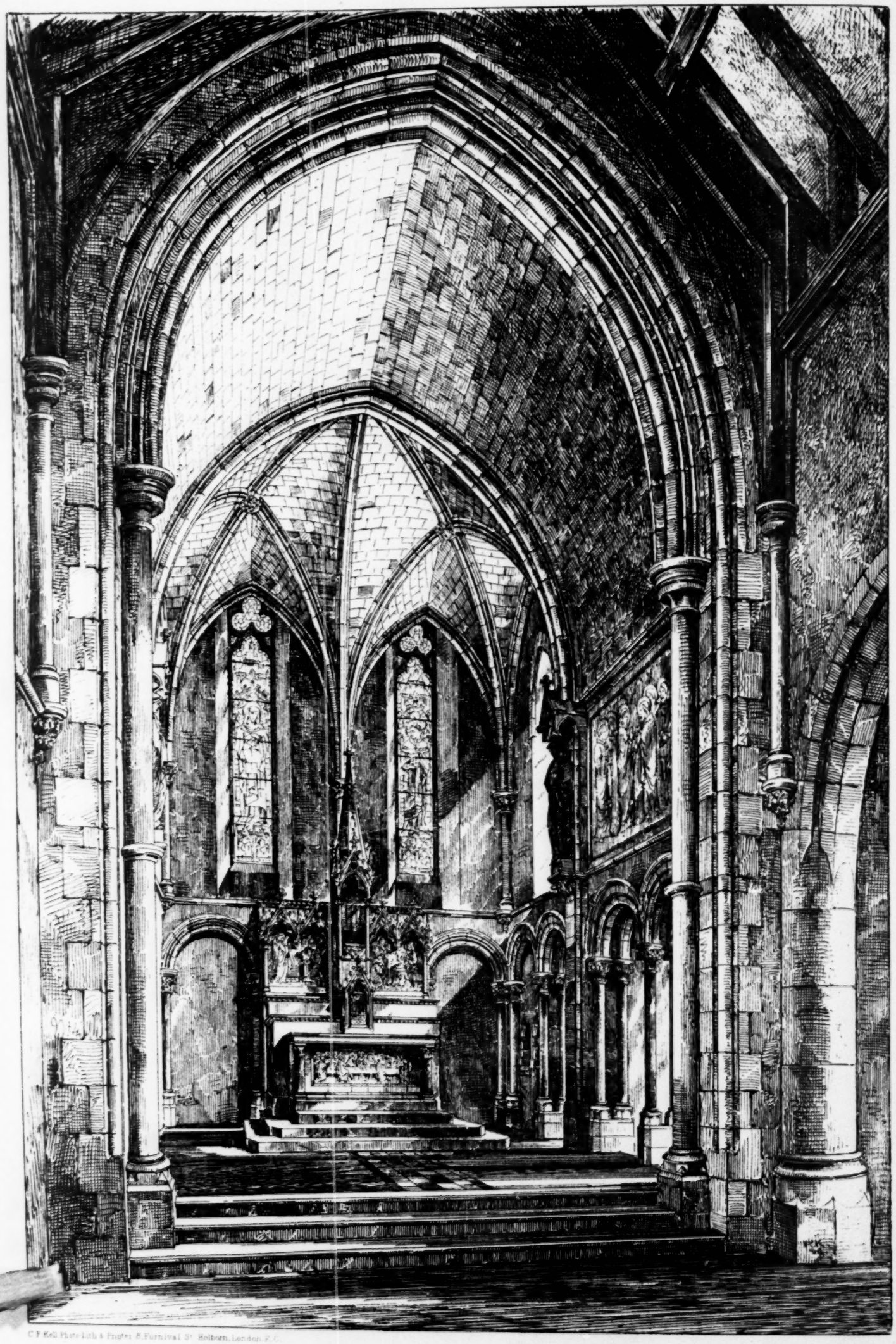


Longitudinal Section thro' Chancel & portion of Nave.

Half Transverse Section thro' Chancel & Nave.

C. F. Kell, Photo-Litho London E.C.

CHURCH OF ALL SAINTS, WARLEY, ESSEX. MR. F. W. TASKER, A.R.I.B.A, ARCHITECT.



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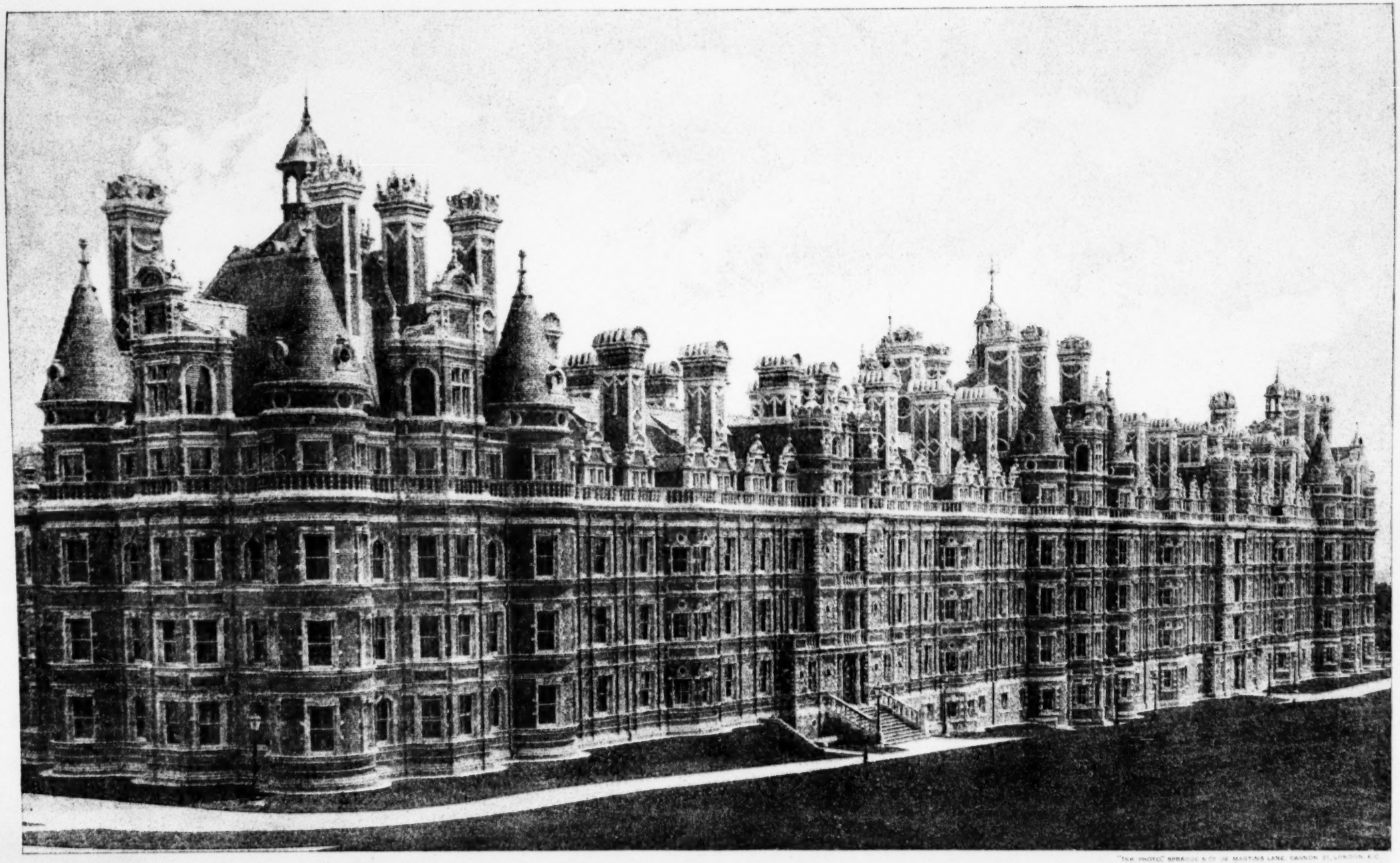
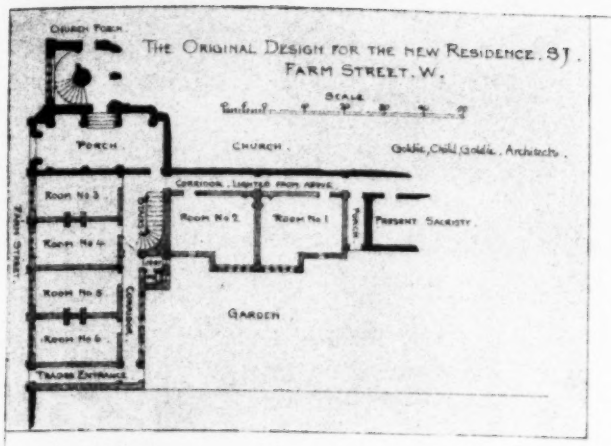
CHURCH OF ALL SAINTS, WARLEY, ESSEX. MR. F. W. TASKER, A.R.I.B.A, ARCHITECT.



HOLLOWAY COLLEGE, EGHAM.—Mr. W. H. Crossland, F.R.I.B.A., Architect.

THE SOUTH WEST FRONT.

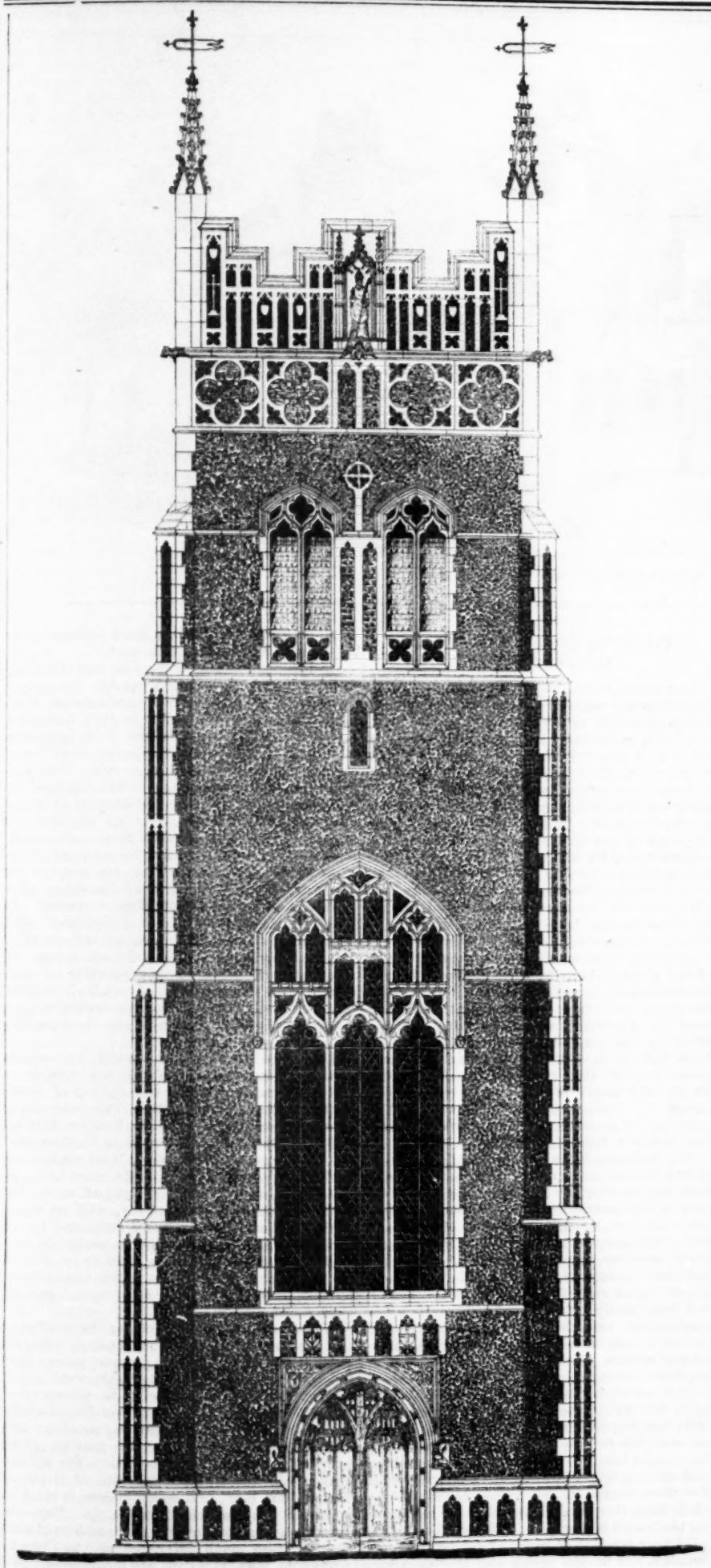
THE BUILDER



INK PHOTO SPRAGUE & Cº LONDON.

THE ORIGINAL DESIGN FOR THE NEW RESIDENCE S.J., FARM STREET, W.

MESSRS. GOLDIE, CHILD AND GOLDIE, ARCHITECTS.



Tower, St. Nicholas Church, Ipswich: as Restored.

RESTORATION OF THE TOWER OF THE CHURCH OF ST. NICHOLAS, IPSWICH.

THE restoration of the tower of this interesting building was commenced in March last and is now satisfactorily proceeding. The condition of the structure had become so dilapidated that apprehensions were entertained for its safety, portions of the buttresses and masonry threatening to fall at any moment. Upon the work being commenced and the outer skin of the tower removed, these apprehensions were more than verified. The heart of the walls of the belfry stage were evidently badly built from the first, and it was found absolutely necessary to pull them down to the level of the belfry stage. It was further decided to grout the tower throughout and to insert iron rods each way across the tower at the level of the intermediate floor. The only new piece of design is the parapet, which replaces one in modern white brick. The rest of the work is being exactly reproduced from the old remains. The new facing is in cracked black flints set in stone lime, with weather bed Ancaster and Aubigny stone for the masonry.

The foundation-stone was laid by Lord Elcho, one of the Members of the borough, on the 6th of May last.

The work is under the supervision of Mr. E. F. Bisshopp, architect and Diocesan Surveyor, Ipswich, with Mr. George Nevard, builder, Kayland. The cost will be about 600*l*.

THE ARCHITECTURAL ASSOCIATION'S EXCURSION TO HARROW.

THE Architectural Association made the second Saturday afternoon visit to Harrow-on-the-Hill on Saturday, the 3rd inst. The members met at Harrow Church, and examined the various objects of interest in the churchyard, under the guidance of Mr. Winkley, the Vestry Clerk; they then passed to the Vaughan Museum, built from the designs of Sir G. Scott; and thence proceeded to the School Chapel, by the same architect. The next building visited was the Speech-room, designed by Mr. Burges. This building, which is a semicircle on plan, and which is said to have cost 25,000*l*., is still unfinished, and is disappointing in effect. The members then visited the old Fourth Form-room, the original school built by Old Sly for a little over 300*l*. This building, with its oak wainscot covered with names, and the old furniture, is a most picturesque place. The original house was enlarged, in 1829, by Prof. Cockerell, at a cost of 10,000*l*. The interior of the church was next visited, and Mr. Winkley pointed out the most interesting features. The best part of the church is, undoubtedly, the roof, which is a good specimen of carved fifteenth-century wood-work. The northern arcade, which terminates at the chancel arch with a quarter circle arch, was pointed out, and its origin discussed; it was thought that the arch was altered to allow access to the rood screen, the springer of the arch on the wall pier being perfectly visible. There are some interesting brasses, amongst others one of John Lyon, the founder of the school, and his wife. After leaving the church the members passed down the High-street, and examined the various school houses by Messrs. Lewis, F. Hayward, and others, and then returned to the Butler Museum, recently built from the design of Mr. Basil Champneys. The foundations of this building caused great trouble, the site being on two beds of running sand; the concrete is 23 ft. deep at the lowest corner, and has three tiers of iron bonding laid all round. The building is of red brick and terra cotta, and is a good specimen of English brickwork.

Sewerage and Drainage Works, Edenbridge, Kent.—Mr. S. J. Smith, one of the Inspectors from the Office of the Local Government Board, last week held an inquiry as to the application by the Rural Sanitary Authority to borrow the sum of 4,233*l*. for drainage works. Mr. Hall, C.E., of Canterbury, explained the scheme, which commences with a 6-in. main at the top of Marlpit Hill, and gradually gets down to the entrance of Church-street with a 12-in. pipe, to be carried thence to the tanks by a 15-in. pipe, where the sewage is to be treated upon 7 acres of ground, with a view of utilising it upon growing crops.

The Brixton Orphanage for Fatherless Girls.—Mr. E. J. Tarver, Architect.

THE BRIXTON ORPHANAGE FOR FATHERLESS GIRLS.

THIS is an institution that has grown from small beginnings. At first, the Honorary Superintendent, Mrs. Montague, gave No. 57, Barrington-road,—a small freehold house, with a pleasant garden,—as a nucleus to start with; by degrees, No. 55 and No. 53, in the same road, were added, and connected by bridges on the first floor level. Another house in Millbrook-road was taken as an infirmary, being approached, at a safe distance, by the gardens, which adjoin each other.

A schoolroom, used also for dining, with a dormitory over, was thrown out behind No. 57, and, in 1882, spacious kitchen offices were added, with further dormitory and bath-room accommodation over, a laundry occupying the further side of the kitchen yard.

The works recently executed by Mr. Marsland, under Mr. Tarver, are shown in the accompanying view, and comprise a schoolroom, 57 ft. by 38 ft. by 18 ft. high, two class-rooms, a large dormitory over the schoolroom, and an attic over that, the class-rooms being surmounted by another dormitory. The former staircase has been carried up to the attic floor, giving access, *en route*, to an inspection-room, looking into the schoolroom, to admit of the busy bee-hive being seen by visitors without disturbing the children.

A new staircase has been built at the far end, forming the exit to the playground through a spacious covered way (the two arches of which are shown in the view) from which the lower water-closets are entered; over the latter, and approached from the staircase, is a mezzanine lavatory, and over that, again, the night water-closets.

Both the staircase and the water-closets are covered in by flat roofs of cement concrete covered with asphalte, from which, as will be seen by the view, the buildings can be comfortably surveyed and repairs seen to, besides which external hooks are secured to the roof, and from the flats or from windows in the dormer-cheeks poles can be laid on the hooks, and the trouble of scaffolds or tall ladders avoided.

Returning to the ground level, a large drying-room has been added to the laundry; the play-ground has been laid with Hobman's tar-paving, and the far corner of it covered in with a large play-shed, while the gardens have been tastefully laid out.

Finally, the three small houses in Barrington-road have been "pulled together" by fixing along the eaves a name-board carried on bracketing and pilasters continued from house to house, while a gateway of sufficient scale to overpower the three house-porticoes, and another gateway in the road-fence, have had the effect of converting three little tenements into one institution.

COUNTRY ROADS AND THEIR MAINTENANCE.*

THE scope of this paper has been purposely limited to the maintenance of rural roadways. Urban districts, as a rule, maintain highways in a fairly satisfactory manner, and where this is not so it cannot be from the want of proper machinery to effect the object sought, but rather that the ratepayers do not demand a higher efficiency of maintenance, from supposed economical reasons, though it is highly probable that efficiency of maintenance and cost are in the inverse ratio, by which is meant that a road with a heavy vehicular traffic, if maintained so as to present as few traction obstacles as possible, will cost less than the same road, having the same burdens to carry, maintained so as to present and numerous obstacles to traction.

By the common law of England, the highways of the country have to be maintained by the inhabitants at large, except in a few isolated instances, which are so infrequent that they may be eliminated as unimportant and not affecting the general law of the land. It is true that up to within a brief period a large proportion of the principal roads coming within the scope of this paper were maintained by trustees as turnpike roads. The principle of maintaining roads by their users has, however, fallen into desuetude.

The theory, and to a great extent the practice, of the maintenance of roads by boroughs and local Boards does not leave much to be desired outside the metropolis. Committees for highways have under them professional men, and the roads are, as a rule, fairly maintained. Such, however, cannot be said of the single parishes having no Local Boards. In these places the surveyor is nominated by the Vestry, and is generally a farmer, whose knowledge of road-making extends to the mere spreading of stones, broken or unbroken, as suits his humour, on the surface of the road at periods, not at regular intervals, nor when the road most needs repair, nor when the weather is most favourable, nor using the most suitable materials. All these important considerations are pushed on one side for the convenience of employing local team labour. When the farmer-surveyor, and also his fellow farmers, have no other work for their horses, or when they cannot get on their land, then work is provided for the teams on the parish highways. In Sussex, during the past year, roads were repaired during the driest months, and in one parish the highways were not only repaired during a long-continued period of dry weather, but were badly repaired, if such a term is applicable to the spreading of large unbroken stones on a hard surface, some of the stones weighing 10 lb. each.

Of Highway Boards it may be said that, like Local Boards, they should provide the proper machinery of a qualified professional road surveyor, and if the roads in such a district are not efficiently maintained it is generally the fault of those who "rule the roost" and pander to a cry of false economy. The part played in the larger area of the counties by the justices in Quarter Sessions is to grant subsidies to local authorities for the maintenance of such roads as they deem main roads, forming continuous routes between considerable towns. These subsidies are granted on the certificate of the County Surveyor that the roads are in a state of efficient repair.* It is clear that this divided jurisdiction and intermixing of areas and local authorities with Imperial authorities and different forms of administering the law, is productive of bad results, and the condition of roads is largely left to individuals who are responsible only to themselves, or to those who are in sympathy with them.

From the accounts published by county justices it is difficult to form any opinion on the comparative cost of the upkeep of roads under different authorities. The cost being given at per mile, without further data on which to form an opinion, it is obvious that the maintenance of a wide, level road, open to the weather, with little traffic, must be much less than that of a narrow road of steep and numerous changes of gradient, with an equal traffic, so that, when we find a main road in one parish costs 40*l.* per mile to maintain and another costs 400*l.*, there is little to be gained by discussing the figures given in county returns, and we must rely upon general observation.

When each parish maintains its roadways and the surveyor is his own master, being an unpaid official, it is not in human nature that he should give that attention to the work which its necessities demand, nor is he possessed of the technical skill to carry out successfully even so simple a duty as the repair of a road; and for these, as well as the reasons given previously, parish roads cost more for upkeep than roads under the supervision of Highway Boards, but here, in a lesser degree it must be admitted, the same objections apply. Farmers, forming a large majority of the members of such Boards, have much deference paid to them by surveyors, who, as a rule, are insufficiently paid and consequently do insufficient and inefficient work, and whose situations are held by so slight a thread that the least show of independence is

* From a paper entitled "The Present Aspect of the Rural Road Question, with some Remarks on the Maintenance of Macadamised Roads." By Mr. E. B. Ellice-Clark, M. Inst. C.E., County Surveyor for West Sussex, read at the Annual Conference of the Association of Municipal and Sanitary Engineers and Surveyors held at Hanley.

* Imperial taxation now contributes about one-fourth of the cost of the maintenance of such main roads by an annual grant of Parliament, which, however, not being regulated by Statute, may at any time be discontinued if the exigencies of the Chancellor of the Exchequer require the money for other purposes.—E. B. E.-C.

considered to be insubordination, and visited with penalties accordingly. So that most of the evils attendant upon the parochial system are inherent in the Highway Board system; in the former they are intensified to such an extent as to be a grave blot on the internal administration of the country.

The dissolution of road trustees has been taking place for many years; the universal outcry against tolls and the collection of the maintenance cost of the roads by road users led Parliament to abolish turnpikes; these roads consequently fell into the hands of the parishes, and it soon became evident that, where formerly the roads were maintained in a highly satisfactory condition, they now rapidly deteriorated, and in many cases had lapsed into as bad a condition as they were a century ago, before road trustees were initiated. The parochial system utterly broke down under the new state of things. As trusts were abolished the area of dissatisfaction spread, and grew to so large an extent, that without exaggeration it may be fairly said that the highways of rural England, which for a century had been the finest in the world, were fast becoming unusable. Parliament then stepped in with the Highways and Locomotives (Amendment) Act, by which roads disturnpiked since 1870, and main roads connecting together considerable towns, might be partly maintained at the expense of the county. Whether such a principle is sound from a political economist's view, is an open question; though, apart from securing more efficient maintenance,—which to a certain extent it does,—the measure recognises for the first time two important features: 1. The breakdown of the parochial system of repair. 2. The necessity of distributing the maintenance cost of rural roads amongst urban and rural ratepayers, the presumption being that the rural districts would be relieved at the expense of the towns. Seven years' working of the Act has proved the contrary. For many roads in urban districts, coming within the scope of the Act, are maintained at a higher cost to the county than the contribution to the county funds from such urban district. The inequalities of this Act, the cumbersome machinery it provides, and its limited scope, restricted to about one-tenth of the highways in the country, were soon amply demonstrated. The Legislature again interposed, and an annual grant is now contributed from Imperial taxation, to the extent of one-half of the sum contributed by the county, as a measure of relief to those rural communities whose grouping with the towns it had been confidently expected would have relieved them of the heavy burdens they succeeded to on the lapse of the road tolls. This branch of the subject is worth much discussion, as a remedy for the existing evils is more likely to be found in the adjustment of the law relating to maintenance cost than in the practice of road repair.

It will be observed, from what has been said, that no fewer than six authorities, extending from the Imperial Legislature to the parish vestry, are interested, and have a voice, in the repair of rural main roads. Instead of Parliament looking at this simple question in a simple manner, it would hardly be possible to devise a more complicated arrangement than has been set up by recent legislation. The Act of 1878 was hardly printed before difficulties arose. On the construction of the word "maintenance," every county has differed. In an able paper by Mr. Lobley, Borough Engineer of Hanley, he enunciates maintenance thus: — 1. Ordinary repairs to the surfaces of paved and macadamised carriage-ways. 2. Extraordinary repairs, such as putting in a good foundation for the pavement or macadam, or using new setts. 3. Scavenging or street-sweeping. 4. Watering. 5. Ordinary repairs to kerbs and channels. 6. Extraordinary repairs to the same, such as the substitution of new material for old. 7. Ordinary repairs to side footpaths. 8. New pavements to side footpaths.

To the foregoing may be added:—9. Capital outlay for the substitution of paving for macadamising. 10. Proportions to be paid for the cost of scavenging and watering. 11. Cost of under-drainage works. 12. Cost of supervision and establishment charges.

It would be impracticable in this paper to enter into the detail of the various ways in which these difficulties have been dealt with. Within the writer's knowledge, independent divisions of the same county interpret the word maintenance in such totally different ways that it would be difficult to recognise that the executives are working the same Act.

Not the least of the difficulties encountered in working the Act is that of accounts. A special form of account has to be kept under the provisions of the Act, by which every hour a man is employed on a main road must be entered, every load of materials, the quantity of water, and the team labour, all have to be separately entered and charged to the main road account. The writer is surveyor to a town having 28 miles of roads, and about 1¼ mile of main roads. The work of maintaining the main road is inseparably mixed up with the maintenance of the other roads. Workmen pass without knowing it from ordinary roads to the main road. Machine sweepers and water-carts do the same thing, a load of water may be half distributed on a main road, and half on an ordinary road. In towns employing a large number of water-carts, say thirty, it is impracticable to sever the work. A main road requires a separate staff, separate carts, separate foremen, separate supervision, to keep the accounts with anything like accuracy, and, if a main road is of insufficient length to provide this separate administration economically, the cost of book-keeping and dividing the cost of maintenance will amount to a large percentage upon the cost of maintenance, and the writer ventures to express the opinion that such an accurate subdivision of accounts as the Act contemplates is nowhere kept. A great many of the items are arrived at but approximately. The same objections apply to the system in rural districts, where there is no clerical staff provided to do the work. The unpaid surveyors of parishes are frequently unable, from want of staff, to keep the complicated accounts, which require such minute division; and instances are not wanting where the unpaid surveyor of a parish has had to pay 30*l.* out of his own pocket during his year of office to have the accounts put into such a shape as would satisfy the Government auditor. It will be readily understood that these unpaid officials have not much zeal in having the roads properly maintained, as, the less work done on the roads, the less book-keeping, and this has no doubt had a good deal to do with the decadence of main roads.

Here, then, we have the existing principle of the maintenance of highways by parishes, clearly proved to be faulty, and inflicting great hardships upon rural communities, focussed into a positive injustice upon individual ratepayers,—as, for instance, upon mill-owners whose imports and exports are performed on railways; the maintenance cost of the transit way they pay in railway rates, while brewers and millers who use the highways very largely have the greater portion of the maintenance cost of the transit way paid for them by other people. These anomalies are eased down to a limited extent by the main roads system, but the complications in administering the Act have now built up such a feeling against the law that a remedy must be found.

A simple, safe, and effective remedy can be obtained by grappling boldly with the subject. Sweep away all distinctions between disturnpiked roads, roads connecting large towns, and county or parish roads, and let all roads that are now repairable by the inhabitants at large be repaired by a single authority, adopting the county or division of a county as the unit of area. As an arbitrary line must be drawn somewhere between the rural and urban districts, fix a principle of demarcation, and exclude all towns of 10,000 inhabitants from the cost of a contribution to the county roads. There is a good reason for adopting this unit, inasmuch as the traffic in towns is a different class of traffic, and the upkeep of roads is performed in a different way. There is precedent for the principle, as the county police establishments are now maintained much on the lines of the above proposal for roads.

The present system of county government is, however, not calculated to give the impression that so great a change from complexity to simplicity could be brought about without representative county government. As a County Surveyor, it is necessary for the writer to speak with that moderation which caution suggests. It is doubtful if the justices who now govern counties by the cumbersome machinery of Quarter Sessions would have additional responsibility thrown upon them without a complete change in the administration of county affairs. Perhaps no body of men in England do their work at less cost than county justices. The great complaint is that they do so little, being an unrepresentative body. Parliament has not hitherto invested them with great powers or entrusted to their management such important affairs as are administered by municipal corporations, and without doubt the fact that they are not subject to periodical election or rejection has serious conscientious effects upon many justices, who would be willing to deal with county funds in a more liberal spirit, and enter into increased responsibilities, were they an elected body, having the sanction and support of ratepayers. In a word, country, or, if the term is unsuitable, county, roads cannot be efficiently maintained without a complete change in county government. Presuming such a change, and an elected Board superseding the present justices, a scheme something on the lines of the following should be administered in the highways department.

There should be a Board for the whole or divisions of a county, having a chief engineer. The area of the county or divisions should be subdivided into districts, which might be determined by (*a*) watershed considerations, or (*b*) facilities for access by railway, or (*c*) density of population (*i.e.*, proximity to large towns). Each district to have its surveyor or inspector, acting under the orders of his chief, who would be responsible to the Board, with the sewerage and other matters that do not touch the present discussion, and roads, under his immediate charge. District committees would be necessary, so as to meet not less than once a month, to whom the inspector would report, the County Board and district committees acting like town councils and other committees. All contracts for materials and labour, manual and team, all appointments and dismissal of officers, would rest with the County Board, who would have under its charge every road now maintained by the inhabitants at large. We should thus have (1) trained men, as paid officials, devoting their whole time to the duties of their office, directly responsible for the proper and economical upkeep of the roads; (2) a standard of efficient maintenance for the whole county would be set up, for which the Board would hold the chief engineer responsible; the divisional inspector would set up this standard of efficiency at comparative costs, for the books should show at a glance what a unit of roadway was costing in each division. This charge of the administration would do more to effect a reform in road maintenance than any attempt to patch up what is now considered to be an obsolete and effete system.

In the first part of the paper allusion has been made to those who have entrusted to them the repairs of roads; it is only necessary to emphasise the contention that the existing system is costly and inadequate, and that roads should be supervised by competent persons, who should be paid for their work and be responsible to a highway committee.

Excepting the main roads of this country, most of the existing country highways were never properly constructed. The routes they follow are the last routes taken by travellers to get on hard ground from the sloughs into which the tracks were made. Formerly no attempt was made to build a road. The traffic passed over a beaten track and in the winter diverged right and left, to get out of mud. This accounts for the singular way in which many existing roads turn and twist, in an apparently inexplicable manner. After the turnpike roads were constructed by engineers, parish surveyors gradually followed, by making an attempt to "make" the parish roads. This consisted of throwing broken stones on to the trackway, and in the course of the last century this process has been added to by surface draining and a little cleansing, so that the highways have assumed the semblance of formed and shaped-up roads. The bottoms are, however, composed of soft stuff, and if the coating of metal is not put on in time, the roads become a mud track. It is too late to preach for the reconstruction of these roads from their foundations. It is impracticable to do anything but maintain them in sufficient repair. In such cases as this, it is necessary to under-drain the roads with pipes with open joints, and the frequency of these will be necessary according to the saturation of the soil. If the subsoil is wet, it will be impossible to maintain a good surface to a road. Surface drainage is of equal importance. Snow, rain, and frost are "sore destroyers" of roads. Side ditches or long water channels are indispensable to the preservation of good surfaces.

Much diversity of opinion exists amongst surveyors as to the cross section or contour of roads. In some counties, roads are "hog-backed" to such an extent that vehicles cannot pass over them with safety, except in the centre; the converse of this is found in leaving a road with a level transverse section, so much out of repair, that it becomes concave instead of being convex. It is obvious that, if the versed sine of the section is too great, vehicles will follow the same track, viz., the crown of the road, which soon becomes worn out, while, if water is allowed to remain in the road, it will be destroyed by the weather. From long experience the author has come to the conclusion that the proper fall for roads repaired with flints or similar material is one in twenty-four from the centre, with broken granite one in thirty-six. The intermediate gradients between these two are those suitable for materials that are harder than flints and softer than granite, as, for instance, hard mountain limestone, which will take its place at about one in thirty. "Barrelling" a road is a mere excuse for not keeping the surface in proper repair.

In nearly every English county good materials for road-making may be found; but, where soft material like sandstone only is to be obtained locally, it will be found economical in most cases to obtain harder stone or granite from a distance than to repair the roads with unsuitable material.

Some difference of opinion exists as to the sizes to which stone should be reduced for metalling a road. There is a prevailing opinion that all stones should be broken to pass a gauge of 1½ in.; the writer ventures to express the opinion that this is an error. All the hardest stones, like granite, trap rock, basalt, the Devonshire dolerite, and similar rocks, should be broken to a smaller gauge than flints and the hardest limestone, which in their turn should be broken smaller than such materials as Kentish rag and stones of a similar character. The method of specifying the dimensions of stone should be abandoned for a weight test. Macadam says, "Every piece of stone put on to a road which exceeds an inch in any of its dimensions is mischievous," and in most of his specifications he insists on no stone weighing more than six ounces. Parnell adopts 2½ in. for the largest dimensions. To within the past few years the latter size was very generally adopted, irrespective of the quality of the material. It has been the practice now for upwards of half a century, when repairing roads with granite and the harder rocks, to have the stones broken as uniformly as possible. The result of this is that, though the general surface may be in good repair, the road will be full of small rises and depressions, the surfaces of which are also rough, stones rising abruptly above the general surface of the road. It is this which causes granite macadam roads to be so unsuitable for light-springed vehicles such as cyclists use. The author has recently been led to investigate the cause of complaints arising from cyclists when travelling over what was apparently a well-kept road, and he has come to the conclusion that it is of as much importance to have stones of different sizes as it is to have a maximum size. The proportion of different sizes requires yet to be determined. So far as his investigations have gone, he gives the following as closely approximating upon the proper proportions of sizes:—

	Maximum weight.	Minimum weight.
	oz.	oz.
Granite and similar rocks.....	3½	¼
Flints and similar stones	5	¼
Limestones and similar stones...	6	1

one-half of the total quantity to be of the maximum weight, the remaining three-eighths to be composed of stones varying between the maximum and minimum. This brings us to the question of binding materials; a road formed of different-sized stones will require no binding materials. In a former paper on this subject published ten years ago, the author stated his conviction that the "decadence of modern roads commenced with the using of binding material," the introduction of which was coincident with the use of stones broken to a uniform size. Longer experience has confirmed this, and, though in practice he is compelled to use materials to bind (?) roads, he does so very sparingly, and only because of the inability to obtain materials broken to various sizes, in sufficient quantity. If the demand is, however, generally set up for proportions of different-sized stones, the necessary quantities will soon find their way into the market.

The introduction of stone-breaking machines has also greatly deteriorated road-mending materials in some parts of the country. No machine has hitherto been made which successfully gets over the cubing difficulty. The tendency of all machines is to deliver a great quantity of irregular pyramidal-formed stones. The extra cost of employing hand labour,—about one shilling a ton on the average,—is probably compensated for in the favourable form given to the stones when broken by manual labour.

There are a few other points to which brief allusion only will be made, as they are so well understood (though not practised) that it is unnecessary to prolong this paper to discuss them. They are the method of spreading materials; on suburban and rural roads the stones must be placed neither too thinly nor too thickly, but in sufficient quantities to enable the stones to form a complete surface over the old roads. As rolling cannot be attempted on roads coming within the scope of this paper, the author lays it down as a canon law for the repair of such roads that repairs should always be done in wet weather. A falling barometer in the winter will indicate to the surveyor the proper time to repair roads.

It is absolutely necessary for the preservation of road surfaces with economy to scavenge roads. Those places where there are trees, high fences, and cuttings will require most attention. Scraping by machine and rotary brushes drawn by horses will be found 33 per cent. cheaper than hand-scraping, and equally effectual.

It is of primary importance that a standard of comparative cost should be set up, so that road authorities may be able to ascertain whether their roads are being economically maintained. County authorities attempt a comparison by fixing the unit of cost at per mile; a few authorities reduce their calculations to the superficial yard. It is obvious that both of these methods are entirely misleading, as the chief factors of road destruction are eliminated. It is necessary to ascertain the number of vehicles and their weight, and that of their burdens, passing over the road in each year, and the width of the roadway.

We are then able to calculate what burden the road carries in proportion to its width, and a comparison can be obtained; though the results of these figures will be misleading if any attempt is made to compare paved roads with macadamised roads, or roads of very great traffic with roads of moderate traffic, as the conditions under which the materials are destroyed are quite different. An instance of this is observed in the cost of macadamised roads. In a paper read by Mr. Deacon before the Institution of Civil Engineers, the maintenance cost of a macadamised road is given at 2s. per every 100,000 tons per annum per yard of width, while sett pavements are quoted as low as 0·25d. for the same unit of cost. It is well known that, when streets are repaired by macadamising, the cost increases in geometrical progression, or nearly so, as the traffic increases beyond a certain number. The author gives below the actual cost of the Western-road, Hove, Brighton, which has a traffic of 164,620 tons per annum per yard of width, and the cost is 5·22*d.* for the same unit, while the author ascertained that a portion of Piccad"ly cost 3s. 6d. for the same unit.

Maintenance Cost of Macadam per 100,000 Tons per annum per Yard of Width.

	s.	d.
Liverpool	2	0
London	3	6
Brighton	0	5·22

This difference is so great that the explanation must be given: in the two former cases the streets were those of enormous traffic, the macadam in wet weather was churned up into mud, and after frosts would be "lickey," with the stones adhering to the wheels; the road would have to be repaired many times in the year, while in the Brighton case the macadam stones were always in their place.

This is cited to show that the costs of urban and suburban roads must not be compared with rural roads, but for comparison they should be divided into different classes, thus:—

Roads with a traffic of less than 10,000 tons per annum, per yard of width;

Roads with more than 10,000 ditto, and less than 50,000 tons per annum per yard of width; and so on.

It is for the County Boards of the future to keep such accounts as will enable proper comparisons to be made.

In conclusion, the author believes that no change for the better is likely to be brought about in the maintenance of rural roads until the present system of road administration, and the incidence of cost, are radically reformed.

UNIVERSITY COLLEGE, LONDON.

DISTRIBUTION OF PRIZES.

Faculties of Arts and Laws and of Science. Session 1885–86.

Gilchrist Engineering Scholarships.—Entrance Scholarship, 35*l.* per annum for two years: R. J. Durley, of London. Senior Scholarship, 80*l.*: L. Martineau, of London.

Slade Fine Art Scholarship (50*l.* per annum for three years).—C. D. Hay Campbell, of Edinburgh.

Architecture (Prof. T. Roger Smith, F.R.I.B.A.).—*Fine Art.* Donaldson Silver Medal, T. L. Worthington, of Manchester. Second Prize, A. B. Yeates, of London. Certificates, 3*. V. H. King, of London. 4*. Eleanor Rowe, of London. Second Class, R. L. Pearce, of Surbiton; F. B. Pemberton, of Victoria. Third Class, R. S. Maynard, of London.—*Construction.* Donaldson Silver Medal, R. L. Pearce, of Surbiton. Second Prize, F. B. Pemberton, of Victoria. Certificates, 3*. E. H. Fry, of Bristol; James Simpson, of London. Second Class, A. E. Habershon, of Walthamstow; E. W. Hands, of London; L. Scrutton, of London. Third Class, J. Hale, of Sevenoaks; G. S. Jones, of Sydney.—*Modern Practice.* Prize, J. J. Muller, of London. Certificate, 2*, C. F. Good, of London. Second Class, A. G. Chalmers, of Perth; W. B. Goodwin, of London; W. H. Raffles, of Liverpool; H. W. Wills, of London; T. L. Worthington, of Manchester. Third Class, W. A. Aickman, of London.

Engineering and Mechanical Technology (Prof. Alex. B. W. Kennedy, M.I.C.E.).—*Senior Engineering.* Prize, L. Scrutton, of London. Certificates, 2*, W. Corin, of Forest Hill. 3*, J. Goodman, of Royston. Second Class, L. Cust, of London; W. St. G. Elliot, of London. Third Class, A. Hayne, of London; R. G. Harding, of London.—*Junior Engineering.* Prize, L. Martineau, of London. Certificates, 2*, equal, Henry Deanesly, of Wincanton; R. J. Durley, of London. Second Class, H. Hutchinson, of London. Third Class, H. G. F. Barham, of Bridgewater, W. C. Kerr, of Blackheath; F. E. Nathan, of London; F. B. Pemberton, of Victoria; F. W. Smyth, of Blackheath; P. R. A. Willoughby, of Bristol.—*Engineering Drawing.* Senior Class. Prize, J. Goodman, of Royston. Certificates, 2*, L. Cust, of London. 3*, A. Forbes, of London. Second Class, L. Scrutton, of London. Third Class, W. St. G. Elliott, of London; R. G. Harding, of London; A. Hayne, of London. Junior Class. Prize, Vito Montalto, of Mazzard. Certificates, 2*, L. Martineau, of London. 3*, G. Baker, of Oakham. 4*, R. J. Durley, of London. 5*, H. Deanesly, of Wincanton. 6*, W. C. Kerr, of Blackheath. Second Class, H. G. F. Barham, of Bridgewater; P. R. A. Willoughby, of Bristol. Third Class, A. M. Brotherhood, of London; A. W. Carne, of St. Agnes; F. E. Nathan, of London; F. W. Smyth, of Blackheath.

Civil Engineering and Surveying (Prof. L. F. Vernon-Harcourt, M.A., M.I.C.E.).—*Civil Engineering.* Prize, L. Martineau, of London. Certificate, 2*, J. R. Wignall, of Liverpool. Second Class, W. C. Kerr, of Blackheath. Third Class, E. A. H. Childe, of Bridgnorth; F. B. Pemberton, of Victoria.—*Surveying.* Prize, F. J. Dawson, of London. Certificates, 2*, J. R. Wignall, of Liverpool. 3*, S. Ll. Whetham, of Bridport. Second Class, A. W. Carne, of St. Agnes; E. A. H. Childe, of Bridgnorth; H. Hutchinson, of London; H. Lazareck, of Aldershot. Third Class, A. S. Allin, of Chiswick; G. C. H. Reed, of London.

A Cheap High-Pressure Water Valve.—A new and improved registered galvanised iron draw-off water-valve has been put into the market by that old-established firm of plumbers' brass-work manufacturers, Messrs. Thos. Lambert & Sons, of Short-street, Lambeth. The construction of this valve seems particularly to suit it for exposed positions; as no water can remain in it after use, so it cannot be affected by frost. For neighbourhoods where a brass tap may be stolen, this galvanised iron valve would be passed unnoticed. It is a screw-down high-pressure valve, and, although its exterior is of iron, its interior or working parts are entirely of brass, thus ensuring durability. It appears to be peculiarly adapted for use in artisans' and labourers' dwellings, in courts, stable yards, and in other situations where rough usage is to be expected.

* Obtained the number of marks qualifying for a prize.

THE PLUMBERS' COMPANY.

THE Master, Wardens, and the Court of this Company dined at Bentley Priory, Harrow, on Wednesday, June 30th. Mr. George Shaw, C.C., Master of the Company, presided, and amongst those present were Mr. Alderman Knill, Mr. Ewan Christian, Mr. E. I'Anson, President of the Royal Institute of British Architects, Mr. Ernest Hart, Mr. P. Magnus, Mr. F. C. Penrose, Dr. Corfield, Mr. J. Bosisto, M.P. (President of the Royal Commission, Victoria), Dr. Danford Thomas, Mr. F. W. Pennefather, Dr. Thorne-Thorne, Dr. Wynter Blyth, Mr. F. Machin, Mr. P. Wilkinson, Mr. R. A. Nurse (United Plumbers' Association), Mr. T. H. Court (Peckham), Mr. S. Cornwell (Bermondsey), and Mr. W. Firth (Kensington).

In proposing "The Standing Institutions of the Country," the Master said that he hoped that the important movement recently set in operation by the Plumbers' Company would meet with considerable aid from both sides of the new Parliament. It was a non-party question. Beyond this he knew that the Company had warm supporters in both Houses.

Mr. B. Stowe (Master of the Tylers' and Bricklayers' Company) having briefly replied,

The Master next gave the toast of "Our Colonial Friends," and in doing so observed that the sanitary work in which the Company was engaged must have a growing interest for the fast-increasing cities of the Colonies and India, and he hoped that the two gentlemen,—Mr. Bosisto and Mr. Pennefather,—whose names he would couple with the toast, would receive some information during their sojourn here which might be serviceable to them in dealing with matters concerning the public health of their respective colonies.

Mr. Bosisto and Mr. Pennefather, in acknowledging the compliment, reciprocated the good feeling expressed by the Master, and, at the same time, enlarged on the importance of the work the Plumbers' Company had taken in hand.

The next toast, "Architecture and Sanitary Science," submitted by the Chairman, was regarded as the toast of the evening. In proposing it, the Master said the aid of the members of the architectural profession was of the greatest moment to the Company at the present time. Without their co-operation, progress would be greatly retarded, if not altogether checked. The Court of the Company had felt from the very outset of the present movement that, in order to effect its objects and secure the efficiency of plumbing work in dwelling-houses, it was essential that architects, sanitarians, plumbers, and builders should unite in one common effort. The institutions of each were represented upon the General Council which was dealing with the matter, and the Plumbers' Company had done, was doing, and intended to do, all in its power to bring the movement to a successful issue. That was not a time for him to enter into details, and he would only say that the first and essential preliminary act,—namely, the registration of plumbers,—might now be looked upon as successfully accomplished. The plumbers of the United Kingdom (both masters and men) had given not only their general adhesion to the scheme, but hundreds had already applied to be enrolled on the Company's register for plumbers, every applicant having to give some evidence of ability, and every application coming before a thoroughly representative, qualified, and impartial committee. He ventured to say, when the movement was in its infancy, that he felt sure the plumbers as a body were fully disposed to rise above the consideration of mere personal interests, and work heartily together to raise the general efficiency of the craft, and thus enhance its public usefulness. What he then expressed as an opinion had since been demonstrated as a fact, and throughout the whole course of the movement the most impressive thing to him had been the general condemnation of inferior craftsmanship. Though it was proposed to establish the system of registration at first in London only, the Company had received very numerous applications from plumbers in all parts of the kingdom desiring to be registered on the same footing as those in London. He was convinced that, when they got their provincial organisations complete, the hundreds of applications would become thousands, and the system and registration would become universal. Although the work of the Company was necessarily arduous, their programme was very simple, and their immediate objects might be classed under three heads:—(1) registration, so that the public and plumbers themselves might know who had and who had not given evidence of qualification; (2) the technical education of plumbers, to compensate, as far as possible, for the falling-off in the apprenticeship system; and (3) the recognition by architects and the authorities of the necessity for more closely supervising plumbers' work, especially in new houses. He coupled with the toast the names of Mr. E. I'Anson, President of the Royal Institute of British Architects, and Mr. Ernest Hart.

Mr. I'Anson, in the course of his remarks, said he was glad of an opportunity of expressing his appreciation of the efforts of the Plumbers' Company for the good of the public health. Their work was one of the utmost importance, and he wished them every success in the undertaking.

Mr. Hart observed that it must be apparent to all that the Company was doing a great work, and doing it in the best possible way, and the result of it must be of the most beneficial nature to the health of the people of the country.

In brief but appropriate terms, the Master next gave "the Health Institutions of the Kingdom," coupling with the toast the names of Dr. Thorne-Thorne, the distinguished Medical Inspector of the Local Government Board; Dr. Corfield, President of the Medical Officers of Health Association; Dr. Wynter Blyth, and Dr. Danford Thomas, Coroner for Central Middlesex.

Subsequently the Master proposed "Technical Education," associating with it the names of Mr. P. Magnus, Director of the City and Guilds of London Institute, and Mr. E. C. Robins. Mr. Magnus, in responding, pointed out that plumbing was one of the fifty subjects in which the City and Guilds of London Institute was organising classes, and he was happy to say that, owing to their connexion with the Plumbers' Company, those classes had greatly increased during the past year, as would be seen from the following figures: in 1885 there were 148 students learning the scientific principles of plumbing, while during the present year the number had gone up to 329; last year eighty-seven candidates presented themselves at the examination, but this year 210 came forward.

Mr. Robins having also responded, the Master very briefly proposed the toast of "the Plumbers' Company," and the proceedings ended.

ARCHITECTURAL ASSOCIATION VACATION VISITS.

SIR,—We shall be much obliged if you will kindly allow us, through the medium of your valuable paper, to draw the attention of the Architectural Association members to the fine examples of old work that will be seen at the visit on the 17th inst. The examples of half-timber work at Chiddingstone are particularly fine, and those who go down in the morning will have plenty of time for sketching. We will arrange for one or two good sketchers to be there who will be happy to give a few hints to those who wish for them.

A. LOWTHER FORREST,
WALTER J. H. LEVERTON,
Hon. Secs. Vacation Visits Sub-Committee.

PROVINCIAL NEWS.

Bucknall. — The new Infectious Diseases Hospital, erected jointly by the local authorities of Hanley, Stoke, and Fenton, at Eaves Lane, Bucknall, was opened on the 30th ult. by Alderman Boothroyd, Chairman of the Board of Management. The building was commenced on the 6th July of last year, and the contractor, after experiencing very bad weather, completed his contract two months ago, with the exceptions of the removal of the old hospital at Penkhull, which is at present being taken down to be re-erected to serve the purpose of a convalescent pavilion. The hospital is built on an isolated plot of land at Bucknall, about 150 yards distant from Eaves-lane, the nearest thoroughfare. It is built on what is known as the pavilion system, and consists of five separate pavilions. The present hospital pavilions will accommodate twenty-eight beds, and, at a push, this number might be increased to forty, as the quantity of air-space,—viz., 2,000 cubic feet, and floor space 144 square feet, is based on the extreme limit. The first, viz., the administrative pavilion, is a two-story building, and comprises on the ground floor a dispensary, waiting-room, living-room for attendant, kitchen, scullery, larder, and store closets; and on the upper story, six bedrooms, bath-room, and airing closet. Externally the walls are built with picked common bricks, with quoins and angles of pressed bricks. The gables are tiled and half-timbered, with plaster work between, and it has been the endeavour of the architect throughout to avoid that bare barrack and barn-like appearance so common in institutions of a similar type. Lightning conductors have been placed on each of the pavilions by Messrs. Blackburn, of Nottingham and Hanley. The architect for the building was Mr. G. W. Bradford, of Hanley; the principal contractor being Mr. J. Gallimore, Newcastle; and the clerk of the works, Mr. Leonard Price.

Buxton (Derbyshire).—Workmen have lately been engaged in fitting up a set of improved needle baths, at the Gentlemen's Hot Baths, in the Colonnade, and another at the Ladies' Hot Baths. These important additions to the already extensive suites of medicinal baths at Buxton were last week inspected by Mr. E. C. Milligan (chairman of the Local Board) and several other gentlemen. The necessity of having such appliances had been urged upon the owner of the baths, the Duke of Devonshire, and such an addition will meet a great want. The combination needle bath consists of needle, shower, back rose, and ascending sitz bath, fitted with a hand hose, shower, douche, and a heavy douche overhead. Of course, the power can be varied in all these cases as may be prescribed by the medical men. There is a special mixer, of globe-like shape, which is made of gun-metal, and through this the pipes run. The object is to mix the hot and cold water in such proportions as may be needed. Immediately over this is fixed a thermometer, the glass of which penetrates the mixer, and thus the exact temperature of the water is discovered, and regulated and applied to the patient as may be necessary. The main pipes are connected with tanks above the boilers and engine-house, and the water conducted through 2-in. heavy lead pipes. Mr. John Smeaton, of Great Queen-street, London, received the commands of the Duke of Devonshire to erect the new baths, and the work of fitting-up has been done by Mr. McKay, the architect under whose superintendence the work has been done being Mr. Henry Currey, of London.

Derby.—On the 2nd inst., Mr. Melville and his architect (Mr. Oliver Essex, of Birmingham) waited on the Improvement and Construction Committee of the Derby Corporation with the plans for the reconstruction of the Grand Theatre, destroyed by fire a few months ago. After some consideration, the Committee decided, subject to some alterations which Mr. Melville promised to make, to recommend the plans to the Council for approval.

Tonbridge.—On the 28th ult. an inquiry was held by Mr. S. H. Terry, M. Inst. C.E., Local Government Board Inspector, as to the proposal of the Rural Sanitary Authority of Tonbridge to borrow 2,500*l.* for the erection of a hospital for their district. The inquiry was purely of a formal character, and at the close of it the inspector said that he should recommend the sanction of the Local Government Board to the proposed loan.

Woodbridge (Suffolk). — The new Sekforde Dispensary, Woodbridge, was opened on the 28th ult. The new building is of red brick, with stone dressings, with a half-timbered gable. It consists of two stories and a basement, the whole being covered in with a tiled roof. Entering the building one finds on the ground floor the dispensary proper, consisting of commodious waiting-room, consulting-room, and dispenser's room, all communicating with each other. Passing to the first floor, which is approached by a wide staircase, with oak rail, one comes to what is the distinctive feature of the new dispensary, a small hospital, which the Governors thought it desirable to erect for men and women to receive medical treatment in cases of accident or urgency. There are two wards, one for males and the other for females, named respectively Victoria (in commemoration of the fact that the opening took place on Coronation Day) and Dorothy, in memory of the founder's wife. For the present two beds will be provided in each ward, though there is ample room for more. Adjoining each ward is a nurse's room, that adjoining the female ward communicating by means of a hatchway window with the ward. There is also a bath-room and a convalescents' lounge on the landing. The architect is Mr. Ernest Carritt, of London, architect to the London estate of the Charity. The building work has been carried out by Mr. Wm. Sealey, of Woodbridge. The cost of the building is about 1,250*l.*

Manchester Architectural Association. In the competition for prizes for the best sketches offered by the President, Mr. L. Booth, F.R.I.B.A. (a report of which was published in our last week's issue), the referee, Mr. A. Darbyshire, F.R.I.B.A., has awarded the first prize, of two guineas, to Mr. F. B. Smith for his water-colour sketch; and the second prize, of one guinea, to Mr. F. Ward for his pencil sketch. Mr. Darbyshire, in his report, speaks very highly of the two successful drawings, and favourably mentions the work of several other competitors. There were six water-colour and seven pencil sketches.

CHURCH-BUILDING NEWS.

Aymestrey (*Herefordshire*). — Aymestrey Church was re-opened on the 29th ult., after restoration. The condition of the building previous to its restoration is described as very deplorable. Upon examination, the timber roofs of the naves and aisles were found to be thoroughly rotten, the boarding upon them decayed, and the lead coverings perished and worn out. The roof of the chancel, from being high-pitched, was in a better state, but all the roofs were concealed by plaster ceilings. The floors were everywhere decayed, and in several places had fallen in, and were resting upon the natural ground; and the whole interior of the building, from being below the surface of the churchyard, and in the entire absence of drainage, had suffered severely from damp and mildew. The work of restoration has been carried out in two sections. The first, commenced in the summer of 1884, comprised new roofs over the naves, aisles, and chancel, which were in all respects reproductions of the original roofs. They are double-boarded, with oak underneath, and covered with lead. The chancel roof is more elaborate, being panelled in oak, with moulded ribs, ornamented with carved oak bosses at the intersections; and, being of a high pitch, is covered with Westmoreland slates. The copings of the gables and parapets are renewed, the Sanctus bell-cote is restored, together with all the masonry more intimately connected with the roofing work. The south side of the tower had been severely ruptured from the battlements downwards, but this has been restored, and the battlements rebuilt. A deep open drain has been constructed all round the external walls, thus preventing the passage of damp to the interior. The second section of the work now completed includes the general repair of the fabric inside and out, and the masonry of the several windows, together with the re-glazing of the windows in tinted glass. The flooring is new throughout, encaustic tiles have been placed in the alleys and chancel, and Lowe's patent wood blocks are used under the sittings. The body of the church has been re-seated with oak, in which is used up the whole of the old wainscot woodwork of the former pews. New oak stalls have also been provided, with new reading-desks and a carved lectern, and the original Jacobean pulpit has been mounted afresh and repaired. Perhaps the most difficult work of any was the repairing and restoration of the several screens, which were very rotten in places, and much mutilated. These screens being of great excellence, and forming one of the chief features of the church, their preservation became an object of the greatest care and solicitude. Mr. Hiles, of Hereford, was the contractor for the first section, and Mr. Edwards, of Leominster, for the second, and each has completed his undertaking well and thoroughly. The various works have been carried out from the designs and under the direction of Mr. Nicholson, F.R.I.B.A., of Hereford, the Diocesan Architect.

Edale.—The new Church of Holy Trinity, at Grindsbrook, Edale, which has been built to supersede the "old chapel" of that name, has been consecrated by the Bishop of Southwell. The new burial-ground attached to the edifice was also consecrated at the same time. The church is of stone, in the Early English Gothic style, and consists of nave, 54 ft. by 24 ft. 6 in. wide; and porch, 5 ft. by 11 ft.; chancel, 29 ft. 6 in. by 18 ft. 6 in.; vestry on the south side of the chancel, and room for a tower (not yet erected), the lower stage of the tower forming space for the organ-chamber. The nave is seated with open benches to accommodate 200 persons. It has an open-timbered roof of pitch-pine throughout, with overhanging eaves, and covered externally with brindled tiles. The total contract for the laying out of the grounds, &c., was about 2,600*l*. Mr. Thomas Beck, of Matlock Bridge, has been the contractor.

Holwell. — The Church of St. Lawrence, Holwell, near Sherborne, has just been re-opened, after restoration. The old church, dedicated to St. Lawrence, was built about the year 1480, and is a good example of Perpendicular work, well proportioned in all its parts and picturesque in outline. The church consists of a nave and north aisle, with transept and porch on the south side, and a fine tower at the west. The chancel, a comparatively modern production, built in a flimsy manner with brick-work covered with stucco, and windows of wood, was in a very dilapidated condition. With regard to the rest of the church, the walls were cracked in various places, and showed signs of settlements having taken place, requiring careful attention and immediate repair. The dressed stonework was much decayed in places, the roofs required to be stripped, and the decayed timber removed. On the inside the stone-flagged floor of the church was very uneven, the old box-pews high and uncomfortable, and the west end was disfigured by a gallery of comparatively little use, only providing sixteen seats, and reached by cramped and creaky stairs. The work just completed consists of building a new chancel and chancel aisle, containing organ-chamber and vestry, reflooring the whole church to the old lines, providing new benches, removing the west gallery, and opening up the tower arch, re-covering the whole of the roofs with lead and stone tiles, constructing a cement concrete channel around the church to prevent damp rising up the inside of the walls, and restoring the decayed stone and other work necessary to preserve the fabric of the building. Many interesting features have been discovered during the carrying on of the work, such as the finding of a hagioscope between the chantry and the chancel, the opening up of the door and steps to a rood-loft, and the remains of a stone reredos with the original decoration on the same. The new benches are of pitch pine, the floors are formed of solid wood blocks laid to a herring-bone pattern, the chancel floor is of encaustic tiles, and the steps of blue Pennant stone. The chancel roof is boarded with pitch pine and panelled with moulded curved ribs. A new oak roof is in course of construction over the Yeatman chantry, with curved brackets brought down on to the old stone corbels which remained in the walls, showing what had been there at some former period. The old pulpit and sounding-board over, a very good specimen of Jacobean woodwork, is re-used on a new oak base. The heating of the church is by means of a Porritt's stove. The cost of the work has been over 1,300*l*., irrespective of the Yeatman chantry, which has been paid for by Mr. M. Yeatman. Mr. Kingman, of Lydlinch, has carried out the work, under the architects, Messrs. Crickmay, of Westminster and Weymouth.

Monkton Wyld (*Dorset*).—There has just been erected in the Church of St. Andrew a complete set of carved oak chancel-stalls and prayer-desks. They are very elaborately carved, and have been erected at the sole expense of the Rector, the Rev. J. B. M. Camm. Against the south pier of the chancel arch a brass, in the form of an angel bearing an engraved scroll, has been placed, with the following inscription:—"To the glory of God, and in loving memory of Anna Maria Camm, who fell asleep, March 30th, 1879. These stalls were dedicated by her son, John B. M. Camm, M.A., Rector of this Parish, June 29th, 1886. 'Be thou faithful unto death, and I will give thee a crown of life.'" The whole of the work has been done by Messrs. Luscombe & Son, carvers and art-workers, Exeter, from the designs of Messrs. Hayward & Son, Exeter. The Rev. J. B. M. Camm has now commissioned Messrs. Luscombe & Son to prepare a carved oak pulpit, with marble pedestal, to replace the present stone pulpit.

DISSENTING CHURCH-BUILDING NEWS

Scarborough.—A new Wesleyan Chapel was opened here on the 2nd inst. The building consists of nave, chancel, transepts, and tower and spire, and the style is Gothic in character. The building is estimated to accommodate 550 people. The cost has been about 5,000*l*. The building was designed by Messrs. Morley & Woodhouse, architects, Bradford, and the work has been carried out by the following contractors:—Masonry and plastering, Mr. W. Peacock; joiner's work, Mr. Scales; plumber, Mr. Stephenson; painter, Mr. Wrightson; upholsterers, Messrs. Tonks; heating, &c., Messrs. Waters & Woodhouse; and the whole work has been superintended by Mr. Robert Turner (all of Scarborough).

Swanage (*Dorset*).—A new Wesley Memorial Church was opened in this town on the 1st inst. Externally, the chief material used is the hard local stone, with Langton and Portland stone dressings, while the interior dressings are in Monk's Park Bath stone. The building is in the style of Late French Gothic, and it has a tower and spire some 110 ft. high. A Caen stone rostrum, worked to the designs of the architects, has been executed and given by Mr. R. Webber, Clapham-road, London, and a three-light window over has been filled with stained glass, representing Faith, Hope, and Charity, the authors of this being Messrs. G. & A. Luxford, of Kentish-town. The whole of the visible woodwork is in oak and pitch-pine. Accommodation is provided for about 530, including the seats in the end gallery. The cost of the building, including value of work and materials given, will amount to some 4,250*l*. The building has been erected by Messrs. Wellstead & Griffin, of Swanage and Broadstone, and the architects are Messrs. Bucknall & Jennings, of Swansea.

Wirksworth.—The new Free Methodist Chapel here has just been opened. The chapel, which is in St. John's-street, is capable of seating 300 persons, and is provided with spacious school-room, vestry, and requisite out-buildings. The plans and designs were furnished by Mr. A. C. Hill, architect, of Derby, and the building and site have cost upwards of 1,000*l*. It is stated in the local papers that the old chapel at Warmbrook, where Mrs. Evans, the "Dinah Morris" of Adam Bede, preached so many years, has now been closed, but it is proposed to commemorate her ministrations by the erection of a memorial tablet in the new chapel. The builder was Mr. W. Asken, of Matlock, Mr. Alfred Shaw being the sub-contractor for the woodwork.

ROMAN CATHOLIC CHURCH BUILDING NEWS.

Glossop.—The memorial stone of the new R.C. Church of St. Mary, at Glossop, was laid on the 3rd inst., by the Right Rev. E. G. Bagshawe, D.D., Bishop of Nottingham. The new church, which is in the Early English style of architecture, and will accommodate about 1,000 worshippers, is being erected to the memory of the late Mr. Francis Sumner, of Park Hall, Glossop, by his heirs, on a site previously given by the Right Hon. Lord Howard, of Glossop. The work is being carried out from the drawings and under the superintendence of Mr. A. E. Dempster, of the firm of Messrs. Dempster & Heaton, architects, Birmingham, the builder being Mr. J. L. Ward, of Manchester. The total cost will be about 12,000*l*.

Newhall.—The new Roman Catholic chapel which has been erected in this village at the sole expense of the Countess of Loudoun, of Willesley Hall, was opened on the 1st inst. The chapel is in the Gothic style, and is built with pressed red bricks and Mansfield stone dressings. It consists of a large chapel, with open trussed ceiling, porch, sanctuary, organ-chamber, sacristy, class-room, &c., the whole of which are well heated with hot-water apparatus. The front gable contains a piece of sculpture representing St. Edward the Confessor, from whom the chapel takes its name. The roof is covered with Broseley tiles. The whole of the work has been carried out from the designs and under the supervision of Mr. W. T. Hampton, architect, Loughborough. The contractor was Mr. William Earp, builder, of Newhall. The building, which is about 90 ft. long by 30 ft. wide, will seat about 500 persons, and has been erected at a cost of about 1,500*l*.

STAINED GLASS.

Cranborne.—The Tregonwell family have just erected a four-light Munich window on the south side of Cranborne Church, in memory of the late Mr. John Tregonwell, of Cranborne and Bournemouth. The subject illustrates the text "Come unto me all ye that labour," and the artists to whom the work was entrusted were Messrs. Mayer & Co.

Kew.—A stained-glass window has been fixed in the apse of Kew parish church by Messrs. Clayton & Bell, of Regent-street, as a memorial to the late vicar, the Rev. P. W. Nott. The glass is described as designed in conformity with the style of the Renaissance. The window contains large figures of Moses and Isaiah, with Predella pictures beneath representing respectively the Sermon on the Mount and the Annunciation. In the opening above the lights is a representation of St. Anne in the

act of teaching a child (St. Anne is the patron saint of the church).

Wellingborough.—A memorial window has just been unveiled in the Wesleyan Chapel, Wellingborough. The window has been presented to the trustees of the chapel by the widow and family of the late Mr. Thomas Norman, as a memorial of the deceased gentleman, and it has been supplied by Messrs. W. James & Co., of Kentish Town, London. It is in three parts. In the centre portion is the figure of Christ surrounded by children, while on each side are representations of angels, in a kneeling posture, bearing inscribed scrolls.

The Student's Column.

STONE QUARRIES.—II.

THE CLASSIFICATION OF ROCKS (*continued*).

AS the aqueous rocks are pre-eminently the building stones of our country, it will be well to enlarge on their classification, and to give a short account of their distribution. It is occasionally found that similar kinds of stone come from widely-different areas, and we shall now endeavour to connect these areas with one another, showing that certain laws and phenomena govern their appearance. The approximate positions of quarries yielding stones of similar nature will then be better understood, whilst the causes of absence of the quarries from other districts will become apparent.

The aqueous rocks of the British islands are enormously thick, and contain a large suite of organic remains or fossils, by means of which they are capable of being divided into many epochs, and it can easily be demonstrated that there is a regular order of succession amongst them, some being older than others. In some parts, certain of the epochs are more or less extensively developed than in our own country; but the general order of succession holds good for strata all over the world, and does not admit of the slightest dispute.

The epochs are characterised by certain fossils,—that is to say, certain fossils are found in the strata comprising each epoch, and nowhere else. The value of this fact is very obvious, not only in regard to its scientific significance, but to its economic importance. When we look at a collection of fossils in a museum, at first sight there does not appear to be anything which would be at all likely to bring about this result. Most people merely regard them as curiosities, pretty to look at, with long unpronounceable names. It is true that this nomenclature deters many people from understanding their full value; but it is absolutely necessary, however, that each fossil shall bear a distinctive name, and their great abundance and variety preclude the possibility of simple English being used. Moreover, even an elementary student of geology is able to distinguish the principal type fossils, and, an outline being established, the details are filled in quite naturally after a little experience.

Let us now proceed to see how they help us. In the first place, they assist in establishing the following broad divisions of the aqueous rocks:—

Tertiary.	Pliocene. Miocene (absent in England). Eocene.
Secondary.	Cretaceous. Oolitic. Liassic. Triassic.
Primary.	Permian. Carboniferous. Devonian. Silurian. Cambrian.

The oldest rocks are placed at the bottom of this list, and the newest at the top.

The principal coal seams worked in this country are found in the beds of Carboniferous age, and it will be seen that beds known as Devonian lie underneath them. Now, inasmuch as certain groups of fossils characterise each of these divisions, it will be clear that, if we meet with those which at a certain locality establish the existence of the Devonian rocks, and if these rocks are in their normal position (a fact that can usually be easily ascertained), we need not trouble to look for the coal measures by boring in them, or otherwise.

A great deal of money would have been saved had this been generally known, say, sixty years ago, when people were accustomed to bore for coal and products of similar great economic value, in rocks where we now know there was not the slightest chance of their being found.

But this is not all. The Carboniferous epoch contains most excellent building materials, and the sandstone quarries in rocks of this age yield stones the quality of which is second to none in the kingdom. How useful, then, are the fossils that can definitely fix such a horizon.

If we calculate the maximum thickness of each of the divisions of strata, as defined by the organic remains which they entomb, and add the whole together, we shall find that the total thickness of the aqueous rocks in the British islands is about twenty miles. Of this, the Primary rocks alone are about 16½ miles thick, the Secondary and Tertiary sharing the remainder.

It must not, however, be supposed that this enormous thickness is met with in any one place or region; neither are all the divisions necessarily complete in any section, no matter how many miles long we make it. Although deep wells frequently aid us in determining the thickness of the Secondary and Tertiary rocks, yet it is rather from measurements taken at places where they "crop out," or come to the surface, that the results are obtained, and the thickness of the Primary rocks is, to a large extent, estimated. If the aqueous rocks were always found horizontally stratified, we should be quite unable to study any but the uppermost three or four of the divisions; but, fortunately, they do not so occur. Generally speaking, they "dip," or are inclined at different angles to the horizon, and the prevalent inclination of the rocks in England is towards the east and south-east. The "strike" (*i.e.*, the direction of the beds at right angles to the dip) will, therefore, be approximately north-east and south-west. And, inasmuch as each of the divisions (except, of course, the Cambrian) is seen lying on its subjacent one, in a regular order of succession, it will be observed that the divisions on plan will run roughly parallel to each other in a north-east and south-west direction. In other words, if the positions of the outcrops of either of the divisions be plotted on a map, it will be seen that they come to the surface only along bands running in that direction. This remark applies rather more correctly to the Secondary and Tertiary than to the Primary rocks, for, as might be supposed, these latter, by reason of their greater antiquity, are more complicated in structure and stratification, and do not, therefore, crop out so regularly. Nevertheless, even the Primary rocks have a general tendency to conform to this rule.

The knowledge of the foregoing facts enables us to see at a glance the approximate position of quarries in stones of similar age and sometimes of a kindred structure. For example, suppose we take the oolitic freestones, we shall find that the principal quarries are situated on a band running from Dorset through Somerset to Gloucestershire, thence to Oxfordshire, Northamptonshire, Rutland, and Lincolnshire, into the north-east part of Yorkshire. The general trend of this band is then north-east and south-west, as we pointed out would be the case, and no quarries in oolitic freestones are found far away from either side of that band.

These observations lead us to the conclusion that, as a rule, the oldest rocks are situated in the western part of England, and the newest in the eastern, so that, if we start in a south-easterly direction from North Wales in the oldest of the divisions (Cambrian), we might pass in upward succession all the divisions, until, having reached the eastern end of Essex, we find ourselves in the newest beds,—the Pliocene, at the top of the list. We shall encounter *en route* gravels, sands, and clays of more recent age than the Pliocene, resting on the various divisions; but these are merely superficial deposits, and for our purposes need not be taken into account.

We have hitherto spoken of the aqueous rocks of England as though they were persistent in thickness and distribution. If this were so, the work of the stratigraphical geologist would soon come to an end; but it is remarkable that, although the Secondary and Tertiary rocks at their outcrops are inclined to be so regular, yet there are considerable variations in thickness, and the minor divisions, both at their outcrops and underneath (as shown by borings), thin out, or become thicker, as the case may be, in different parts of the country.

To illustrate this, we might mention that under London, Devonian rocks were met with at about 1,060 ft., in a boring at Messrs. Meux & Co.'s brewery, Tottenham Court-road. This boring begins in the lower part of the Eocene. The lower Secondary rocks are very attenuated, some of the minor divisions being quite absent, and the uppermost Primary rocks are missing.

The work of the stratigraphical geologist is thus extremely complicated, and he who knows the extension and development of the different beds, both at the surface and below, is best able to decide on matters connected with coal-finding, water-supply, &c.

As the chemical composition and minute lithological character of building stones vary even in the same quarry and along the same horizon, it is not to be wondered at if, when that horizon is traced over a considerable area, it should gradually undergo a complete change, say, from a limestone into a loose sand. Although many beds are persistent in character,—some of the subdivisions of the oolite and the upper cretaceous (chalk) for example, yet we must not conclude that, because a certain stone of good quality is found in a certain formation in one district, that the formation is made of that kind of stone in another, or, indeed that in the latter district it is stone at all; it may be clay or sand. It must be remembered that the divisions are based on the organic remains found in them, and not on their lithological character.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

9,942, Doors and Door-Fastenings. G. Beadon.

The improvement consists in connecting the movable batten sometimes affixed to the bottom rails with the lock gear, so that by turning the handle the fastening bolt is withdrawn from the striking plate and the movable batten simultaneously raised from the floor before the door is moved on its hinges, and when the door is open the batten is kept elevated from the floor and the bolt kept withdrawn within the lock frame until the door is closed, when the fastening bolt is again moved into its socket in the striking plate and the movable batten closed on the floor by its own weight without the use of springs or rising hinges.

10,082, Roofing. J. Storer.

A paper or millboard is treated on the surfaces or is saturated with an insoluble silicate. First, the paper is saturated with a solution of silicate of soda or silicate of potash, and afterwards a solution of a soluble salt is applied, such as a chloride or sulphate of calcium, magnesium, strontium, barium, or zinc; or the oxides of these metals are applied in powder or made up as a milk or wash. By this means an insoluble silicate is formed as required in or on the paper or millboard, and the soda or potash or salt is removed by washing. The advantage of this material is that when used in certain situations rain water cannot dissolve anything from it, and can be stored for domestic use in a very pure state.

2,833, Spring Balances for Window-Sashes. A. J. Boult.

This balance, which answers for sashes, gives forth a power substantially of the same strength in all parts of its stroke, and consists in an arrangement of levers placed between the spring and the weight or body to be balanced, so that increased power is secured by increased leverage as the tension of the spring is increased, whilst decreased power results from decreased leverage as the tension is lessened. The arrangement of levers resembles that of the "lazy tongs."

5,994, Preserving Timber. G. Mancion.

This invention consists in saturating the wood with an arsenical preparation in two or three different solutions. These mixtures are applied to the timber after it has been placed in a suitable closed receptacle, and subjected to the action of low-pressure steam to swell the wood and to create a vacuum for the reception of the antiseptic solutions afterwards employed. The process is particularly applicable to railway sleepers, piles, telegraph posts, wood pavement, &c.

NEW APPLICATIONS FOR LETTERS PATENT.

June 25.—8,373, H. Whitaker, Fireproof Construction.—8,380, J. Rothwell, Hoisting Engines.

June 26.—8,417, L. Dondy, Wall Decoration.—8,418, W. Wodson and R. Skeoch, Manufacturing Bricks, Ridge Tiles, &c.—8,425, J. Sawney and C. D. Quick, Sizing loose-coloured Wall-paper and Distemper Decoration.—8,427, T. Roberts, Stove.

June 28.—8,452, R. Thompson, Automatic Window Sash Fastener.—8,456, E. Bailey and C. Mackey, Casement Fasteners, &c.—8,463, W. Horn, Latches for Doors and Gates.

June 29.—8,504, S. Bott and C. Homer, Fastenings for Shutters.—8,529, J. Radford, Springless Door-latch.

June 30. — 8,558, T. Twyford, Water-closet Basins.—8,560, G. Barlow, Louvre Brick Ventilators.—8,565, G. Oulton, Flushing Water-closets.—8,584, F. Botting, Flushing Water-closets.—8,593, J. Luke, Paper Floor-coverings.

July 1.—8,623, J. Royle, Self-locking Clamp.—8,624, J. Bennison, Chimney-pots.—8,637, C. Gumpel, Holding Sliding-sashes at any desired height.—8,643, H. Heim, Fireplaces or Stoves.

PROVISIONAL SPECIFICATIONS ACCEPTED.

6,124, G. Frith, Drain Trap. — 6,155, J. Stidder, Lavatories.—6,292, G. Sharp, sen., Chimney Top or Ventilator.—6,441, N. Rosekilby, Centre Boring Bits.—6,452, H. Haddan, Tonguing Wood or Stone.—6,926, A. Clark, Sawing Machines.—7,079, H. Bridgen, Sash Fasteners.—7,100, J. Rollason, Wedge for Securing Doors and Windows.—7,184, F. Hochuli, Saw Sets.—7,250, H. Johnson and T. Wilson, Ventilator.—7,338, E. Picard, Manufacture of Glass.—7,884, T. Normanton and S. Major, Outlets for Ventilators, &c.—8,086, J. Haswell and J. Bosworth, Chimney Tops or Ventilating Cowls.—6,086, J. Martin, Draught-preventing Appliance.—6,121, J. and W. Matthews, Brick-making Machinery.—6,182, R. Little, Sash Windows.—6,344, J. Kudlicz and J. Vaclavek, Gullies and Traps.—6,475, T. and W. Garforth, Tieing Brick or Stones together.—6,568, G. Hardingham, Wood Screws.—8,085, R. Bowman, Electrical Thief-proof Lock.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to opposition for two months.

6,579, J. Denny, Tiles.—7,968, G. and R. Dawes, Locks and Latches.—10,384, A. Dalziel, Automatic Electric Fire Alarm.—10,468, C. Perrot and A. Habershon, Sliding Canopy Stoves.—11,110, H. Lake, Pavements, Flags, or Slabs.—12,322, F. Smith, Chimney Top.—9,529, C. Winn, Water-closet Apparatus.—9,617, J. Morrell, Dustbins.—9,664, F. Iles, Sewer or Drain-traps.—10,365, T. Glover, Stench Traps or Gullies.—10,960, D. Law and Others, Fastening for Rain-water Pipes, &c.—14,559, R. Lee and J. Hodgson, Fireproof Pillars and Columns.—5,079, C. Schmidt, Apparatus for Ascertaining the Escape of Gas from Gas-pipes under Ground.—6,688, A. Dalmas, Wood Paving.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

JUNE 23.

By BUCKLAND & SONS.

Colnbrook, near—Colne Villa, and a cottage, freehold	£515
A plot of market garden land, 1a. 2r. 13p.	215

JUNE 24.

By BUCKLAND & SONS.

Datchet—5 and 6, The Avenue, freehold	1,525
House and shops, schoolroom, and two cottages, part freehold and part copyhold	2,350

JUNE 26.

By MESSRS. SPELMAN.

Brundell, Norfolk—Two houses and 7a. 3r. 13p.	940
A plot of land, 2a. 2r. 37p., freehold	200
Four cottages with gardens	230
Three enclosures of freehold land, 28a. 0r. 39p.	1,675
Two cottages, and 4a. 1r. 0p., freehold	505
Home Close, and 7a. 3r. 14p.	830
Enclosures of marsh land, 62a. 1r. 10p., freehold	1,700

JUNE 28.

By S. WALKER & RUNTZ.

Regent's Park—27 and 35, Avenue-road, 19 years, no ground-rent	1,500

By GEO. GOULDSMITH, SON, & CO.

Belgravia—17 and 18, Wilton-street, 38 years, ground-rent 10*l.*	4,220
2, 21, and 22, Wilton-street, 38 years, ground-rent 15*l.*	6,360

By ELLIOTT, SON, & BOYTON.

Edgware-road—No. 63, term 38 years, ground-rent 12*l.* 12s.	1,210

By T. TURNER.

Edgware-road—56, Queen-street, 17 years, ground-rent 6*l.*	340

By GARDEN, BERDOE, & CO.

Upper Tooting—1, Victoria-villas, 78 years, ground-rent 6*l.* 15s.	690
Upper Holloway—38 and 40, Cromwell-road, 75 years, ground-rent 8*l.* 10s.	295

By J. P. HOPE.

Acton—29 and 31, Antrobus-road, 95 years, ground-rent 10*l.*	335

JUNE 29.

By WESTON & SON.

Brixton—22, Loughborough Park, 36 years, ground-rent 5*l.*	380
43, Burton-road, 49 years, ground-rent 5*l.* 10s.	385
Blackfriars—7 and 8, Hatfield-street, 14 years, ground-rent 11*l.* 4s.	305

By DEBENHAM, TEWSON, & CO.

Enfield—Chase Hill House, and 7a. 2r. 33p. freehold	3,500
Brixton—64 and 65, Brixton-rise, 84 years, ground-rent 43*l.*	3,010
Norbiton—8, Richmond-villas, and plot of land, 83 years, ground-rent 6*l.* 10s.	275
Gipsy-hill—7 and 8, Palace-villas, 64 years, ground-rent 10*l.* 6s.	300

By W. WHITELEY.

Highgate—Whitley House, 77 years, ground-rent 32*l.* 10s.	1,600

By HARMAN BROS.

Wapping—1 and 2, Hilliars-court, copyhold	170
Regent's Park — Ground-rent of 25*l.*, term 23 years	360

By BRAY, WEBB, & ELDRIDGE.

Mile-end—23 to 33 odd, Coborn-road, 16 years, ground-rent 27*l.*	£475
Ealing, Haven Green—Howorth Cottage, copyhold	750
West Kensington—3, 4, and 5, Glazbury-road, 90 years, ground-rent 17*l.*	2,900

By GARROD, TURNER, & SON.

Suffolk, Stutton—The residence Crepping Hall, and 240a. 0r. 2p., freehold	7,000
Enclosures of land, 26a. 0r. 22p., freehold	1,110
Three freehold cottages	450

By MESSRS. SPELMAN.

Norwich, Sprowston-road—Freehold house and 1a. 1r. 4p.	570
St. Giles's-street—Freehold house and shop, and the Raven Stores Tavern; two houses in Lower Goat-lane; and three warehouses in Upper Goat-lane	5,050

By H. RUTLEY.

Balham—94, Balham-grove, freehold	235
Hornsey—52 and 54, Nicholay-road, freehold	360
81 and 83, Duncombe-road, freehold	300
Freehold coach-house and stabling	250
Regent's Park—106, Gloucester-road, 65 years, ground-rent 8*l.* 8s.	400
Kilburn—2, Chichester-road, 71 years, ground-rent 6*l.*	310
93, Pembroke-road, 76 years, ground-rent 8*l.* 10s.	200
Holloway—53 and 54, Whistler-street, 94 years, ground-rent 9*l.* 10s.	385
Richmond—7 to 18, Rosedale-cottages, freehold	1,500
Kilburn—65, Princess-road, 76 years, ground-rent 8*l.* 10s.	400
Peckham—39, Avondale-road, freehold	385

By MOSS & JAMESON.

Stoke Newington—Fairview Cottage, 53 years, no ground-rent	485

June 30.

By D. SMITH, SON, & OAKLEY.

Stockwell—Ground-rents of 146*l.* per year, reversion in about 54½ years	3,700

By CHADWICK & SONS.

Chiswick—The residence Thames Bank, and 1a. 1r. 0p., freehold	3,000

By E. ROBINS & HINE.

Chelsea—The Vale, 22 years, no ground-rent	1,250

By DALE & SON.

St. George's-in-East — Ground-rent of 18*l.* 18s., term 14 years	140

By CRONINS.

Kennington—Ground-rent of 12*l.*, reversion in 24 years	380

By C. C. TAYLOR & SON.

Mile-end—29, Beaumont-square, 42 years, ground-rent 4*l.* 15s.	300

By H. S. WOODCOCK.

Kentish Town—55, Burghley-road, 81 years, ground-rent 5*l.*	420

By BRAY, WEBB, & CO.

Peckham—135 to 153 odd, Kimberley-road, 87 years, ground-rent 50*l.*	1,110
East Dulwich—116 to 122 even, Upland-road, freehold	960
180 and 182, Friern-road, 93 years, ground-rent 13*l.*	400

By C. & H. WHITE.

Kennington-road—No. 265, term for lives, ground-rent 4*l.* 5s.	225
Stockwell—67, Stockwell-road, freehold	1,180
Ground-rents of 301*l.* 3s., reversion in about 56 years	8,635

JULY 1.

By WAGSTAFF & WARMAN.

Highbury — 15, Highbury Quadrant, 63 years, ground-rent 18*l.* 18s.	1,300

By RELPH & SON.

Bexley Heath—Freehold house and shop	900
Woolwich—11, High-street, freehold	665
Bexley—The freehold residence Easdale	790

By OWEN & CO.

Bow—8 and 10, Elizabeth-terrace, and factory, freehold	770

By G. J. EVERARD & CO.

Anerley—34, Anerley Park, 236 years, ground-rent 15*l.*	820

By NORTON, TRIST, WATNEY, & CO.

St. Martin's-lane—1, 2, 3, and 5, West-street, freehold	5,660
Mile-end—133 to 147 odd, Sydney-street, freehold	2,640
Ground-rents of 7*l.*, reversion in 7 years	905
Ground-rents of 7*l.*, reversion in 9 years	610
Ground-rents of 3*l.* 10s., reversion in 10 years	255
121, Sydney-street, with stabling, &c.	1,060
26, 28, 32, 34, and 36, Raven-row, and extensive premises, freehold, area about 51,000 ft.	4,900
40 and 42, Raven-road, freehold	605

By FOSTER & CRANFIELD.

Highgate—Ground-rent of 29*l.* 8s., reversion in 98 years	690
Lower Clapton—53, Almack-road, 86 years, ground-rent 5*l.*	295
Willesden-lane—Ground-rents of 21*l.*, reversion in 96 years	495
Hampstead—Ground-rents of 16*l.*, reversion in 93 years	390

JULY 2.

By F. J. BISLEY.

Southwark—21 to 26, Bath-street, 54 years, ground-rent 27*l.*	1,650
Bermondsey—131, Alscot-road, 40 years, ground-rent 4*l.* 7s.	600
112, Grange-road, freehold	440

By TOPLIS & HARDING.

Fulham-road—276, 278, and 280, term 76 years, ground-rent 4*l.*	4,880
49, 51, and 55, Hollywood-road, 76 years, ground-rent 3*l.*	3,000
Improved ground-rents of 44*l.*, term 76 years	880
Hoxton, Hyde-road—The Olde Flinte House, and 63, Hyde-road, 41 years, ground-rent 13*l.*	1,000
Hackney-road—50 and 52, Weymouth-terrace, freehold	800
Peckham—24 and 26, Downes-street, freehold	380
Thornton Heath—Ground-rent of 52*l.*, reversion in 37 years	1,200
Epping, near—Freehold house and shop	270

By GREEN & SON.

Harold Wood—Five freehold houses on the terrace	£1,090
The Post-office, and shop adjoining, in Station-road	610
The King Harold Hotel, freehold	1,400
Enclosure of land, 33a. 3r. 7p., freehold	3,720
Six freehold residences	1,175

MEETINGS.

SATURDAY, JULY 10.

Architectural Association.—Visit to the Junior Carlton Club. 2·45 p.m.

St. Paul's Ecclesiological Society.—Visit to St. Mary Cray and Paul's Cray. Train from St. Paul's Station at 3·15 p.m.

Association of Municipal and Sanitary Engineers.—Annual Meeting at Hanley. 10 a.m.

WEDNESDAY, JULY 14.

Parkes Museum.—Extraordinary General Meeting of Members, to consider desirability of amalgamating with the Sanitary Institute and of applying for a Royal Charter. 5 p.m.

SATURDAY, JULY 17.

Architectural Association.—Visit to Penshurst Place and Chiddingstone. (See advertisement on front page.)

Miscellanea.

The Dutch Church, Norwich.—At the meeting of the Norwich Town Council last week, the Town Clerk read a letter from Mr. Fred. Oddin Taylor, hon. secretary to a committee of gentlemen who have purchased the lease of the building known as the Dutch Church, St. Andrew's, for the purpose of presenting it to the city, upon condition that the building is for ever hereafter used as an adjunct or accessory to St. Andrew's Hall, subject to the right of the Dutch congregation to use the same two days, a Sunday and a Monday, in each year, for so long as they may desire to do so. Mr. Wild moved—"That this Council warmly appreciates the philanthropic motives which have induced Mr. Frederic Oddin Taylor and the gentlemen named in his letter to purchase the Dutch Church for the purpose of its being for ever hereafter used as an adjunct or accessory to St. Andrew's Hall, subject to the right of the Dutch congregation to use the same two days per annum, on Sunday and Monday, for so long as they may desire to do so; and that the gentlemen of the committee in attendance be at once invited to make the presentation." This, he said, was one of the most graceful things done in this generation. It has rescued a historical building from other uses to public purposes. It was undesirable that St. Andrew's Hall and the Dutch Church should be divorced from each other. No doubt their thanks were primarily due to Mr. F. Taylor for the public spirit with which he had taken up this mater. He took the whole responsibility upon himself, and might have had to bear the entire cost, though he did not suppose Norwich would have allowed him to bear that burden. Mr. Taylor had, however, been to a large extent backed up by his fellow-citizens, and he sincerely trusted that the 200*l.* still wanted would be shortly forthcoming, so that the committee might be relieved from their responsibility. The motion was agreed to.

The Egypt Exploration Fund. — On Tuesday a special general meeting of the supporters of the Egypt Exploration Fund was held in the theatre of the Royal Institution, Mr. C. T. Newton in the chair. Mr. Ernest Gardner read a report of the season's work at Naukratis, the earliest Greek city in Egypt, and the chairman laid on the table the first part of the society's forthcoming publication on the excavations and researches now in progress at Naukratis. He pointed out that of five great temples, mentioned by the Greek literary authorities, four had now been discovered, two this season and two in Mr. Petrie's previous explorations. In the *temenos* or shrine of the Dioscuri the plan of a temple built of unbaked mud brick, faced with plaster, had been recovered. In front of it were pillars of the same materials. The temple of Aphrodite consisted only of mud-brick walls, enclosing one, or in the earlier temple two chambers. In front of it was a great altar, built of ashes, held together with a mud-brick casing. The yard of the temple was covered with a layer of fragments which had yielded a great number of vases and statuettes, more or less perfect. These were all of early period, and many were inscribed in the characters of the sixth century B.C. The *temenos* of the Samian Hera had also been found, but had not been rich in results. Some smaller articles had been found in the town, including a beautiful portrait head of the period of Bereniko II. in blue porcelain.

The Indo-Colonial Exhibition and Emigration.—The opening of an Emigration Inquiry Office in the Exhibition at South Kensington will for several reasons be regarded as an important step in the right direction. As to its economic significance there is little need for us to speak, though its salutary influence in helping to deplete an over-charged labour-market is obvious. Another aspect of emigration should not be forgotten. There are many in humble life who are and may long continue to be physically sound, but who are constitutionally unsuited to our uncertain climate. Every one is familiar with the lymphatic type so common in Teutonic races. Capable of much muscular exertion, but dependent in a marked degree upon wholesome conditions, it suffers unduly by the crowded and laborious life of great cities. Emigration to the Southern Colonies offers, to any who inherit this predisposition, the opportunity of labour out of doors in an equable climate, and in that the best assurance of healthy development with a maximum of usefulness in time to come. For working men generally, indeed, if they be healthy, active, and sober, the chances, both vital and social, are often more favourable in Wider Britain than at home, more favourable in point of daily bread, and, for the enterprising, of advancement. At the same time, all will admit that an emigrant rush is by no means desirable either for the emigrants or the country they leave behind. Fortunately it is not likely to occur. Of our unemployed but able population, particularly in the towns, we may still say there is enough and to spare.—*Lancet.*

A New Application of Electrical Power.—We have before had occasion to place on record the useful work done by means of electricity at Hatfield, both at the Marquis of Salisbury's house itself, and on the estate. In addition to the various operations of lighting, pumping, pile-driving, weed-cutting in the river, &c., another application of the power has just been perfected by Mr. Shillito, the resident electrician on the estate,—one which, as far as our experience goes, is quite novel. Ensilage is being stored on a large scale for the use of stock at one of the farms, where for this purpose some of the old farm buildings have been converted into silos. This year it has been decided to chaff the green food before placing in the silo, and this arrangement has necessitated the placing of the chaff-cutter used in cutting up the rough grass some 20 ft. above the ground. The electrical power is used not only for driving the cutting-machine, but also for elevating the grass to the level of the cutter. Some four tons of rough grass are raised and cut per hour by this means. The generator, a sixteen-light "Brush" machine, driven by a water-wheel, is situated a mile and a half distant, on the banks of the river Lea; the electrical power being transmitted to one of Siemens Bros. D 2 type, specially wound to work as a motor with the "Brush" machine. The same source of power is also brought into use in working the elevators at the various hayricks on the estate.

Improved Folding Lattice Shutter.—This folding lattice shutter, patented and made by Messrs. Rownson, Drew, & Co., has for its object the better guarding of windows and doors of private houses, offices, warehouses, and shops, where space, security, and ventilation is a great object. It consists of two wings of equal size, each of which is composed of a number of perpendicular flat iron bars crossed by a number of short horizontal bars strongly riveted together. The perpendicular bars are regulated in length to the height of the door or window, and are placed at equal distances from each other; the principal perpendicular bars run upon wooden rollers upon the window board or door sill. The lattice is fastened in a suitable manner to the brickwork or panels right and left of the door or window to be protected. The lattice is locked in the centre, also near the top and bottom. The advantages claimed for this folding lattice shutter over ordinary revolving and other shutters are that it is much cheaper, and can easily be fixed anywhere without any alteration to existing brickwork or panels; the windows can be left wide open, thereby admitting light and air, at the same time protecting the room against burglars; it is likewise adapted for nurseries in upper stories.

Pulpit, Ogley Hay Church.—Messrs. Jones & Willis, of Birmingham, have just erected in Ogley Hay Church a Caen stone pulpit.

Building Sites at West Kensington.—Last week, Messrs. Fox & Bousfield offered for sale, at the Auction Mart, the freehold building land in West Kensington forming part of the Mornington Estate, and comprising six acres. It was described as the only uncovered ground now available for building upon in the district, and well adapted for the erection of villa and terrace houses. The property was submitted in six lots, the first lot offered containing nearly three acres, situated close to the proposed continuation of Cromwell-road, southwards, and affording sites for the erection of about sixty houses, or for a large public building or works. The biddings commenced by an offer of 6,000*l.*, and 9,000*l.* having been reached without any further advance, the auctioneer observed that the sum offered was scarcely one-half its value, in proof of which he said that only a short time since 18,000*l.* was paid for it, and 12,000*l.* readily advanced on mortgage. It was ultimately withdrawn at 9,950*l.* The second lot offered comprised another building site, having a frontage of 500 ft. to the intended continuation of Cromwell-road, for the erection of thirteen houses, but 1,700*l.* being the highest offer, it was likewise withdrawn, as were also the four other lots, containing together sites for the erection of eighty houses.

Great Depreciation in the Value of Landed Estates in Cornwall.—A notable instance of the decreased value of landed estates in various parts of the country was shown last week at the Auction Mart, when Messrs. Fox & Bousfield offered for sale the Boscastle Estate, situated on the north coast of Cornwall, about seventeen miles from the towns of Launceston and Bodmin. The estate, which is about 1,000 acres in extent, was described as containing the greater part of the town of Boscastle, with its harbour and quays, upwards of fifty houses, and warehouses and commercial premises, a large number of farms, together with several building sites on various parts of the estate, suitable for the erection of all classes of houses, shops, and trade premises, the whole producing a rental of nearly 2,000*l.* a year. The first offer for the property was 20,000*l.*, and by advances of 1,000*l.* each it was brought up to 30,000*l.* when the biddings slackened, on which Mr. Bousfield, the auctioneer, observed that only two years ago, in 1884, the estate could have been sold for 65,000*l.*, that sum having been offered for it and refused. He announced, however, that it would now be sold at the price offered if there was no advance, serious as the loss would be. It was eventually sold for 35,000*l.*, the auctioneer remarking that never, in the course of a lengthened experience, had he known of such a ruinous sacrifice of landed property.

Society of Arts.—The hundred and thirty-second annual meeting of the Society of Arts was held on Wednesday, June 30th, at the Society's House, in the Adelphi. The annual report was read by the Secretary, and contained the usual summary of the proceedings of the session of the society just concluded. Seventy-six meetings were held, at which papers had been read and discussed, or lectures delivered. The total number of members of the society is now 3,657; the financial condition of the society is prosperous, the revenue of the past year having amounted to 13,450*l.*, against an expenditure of 12,000*l.*, with an excess of assets over liabilities of 13,000*l.* A ballot was taken for the new Council, and resulted in the re-election of H.R.H. the Prince of Wales as President, and the following, amongst others, as Vice-Presidents:—H.R.H. the Duke of Edinburgh, K.G.; H.R.H. Prince Albert Victor of Wales, K.G.; the Duke of Abercorn, C.B.; the Duke of Manchester, K.P.; Lord Alfred S. Churchill, and Lord Sudeley. Twelve ordinary members of of council and two treasurers were also elected, and Mr. H. Trueman Wood as secretary.

Roman Remains at Cologne.—Although Cologne (or rather Deutz across the Rhine) is acknowledged to have been a Roman settlement there is no positive trace of this fact in the works of any Roman author. The first records to this effect are those of the chroniclers of Charlemagne's period. Later writers attribute the erection of the camp to Constantine; while others assign to it the date of Julius Cæsar; there being, however, no historical evidence in support of this latter conjecture. Although remains of a tower and relics of the twenty-second legion were found in 1827, the first organised scheme of excavation was inaugurated by Herr Wolf in 1879. According to the data he established the camp was almost exactly a square, the length of the sides being respectively 505 ft. and 499 ft. On the east side were four round towers, which jutted out from the walls; the latter being about 12 ft. in thickness. Inscriptions discovered would seem to point to the year A.D. 160 as the period of the foundation of the camp, which was probably strengthened at the time of Constantine. Eumenius assigns to him the construction of the bridge at Cologne, while Karlhoff's chronicle of 1499 attributes its erection to Pepin the Great. Bishop Bruno, on account of the misdeeds perpetrated by night on the bridge, is said to have destroyed it in 930, the stones being used for the building of the Church of St. Pantaleon. It is, however, considered by Herr Schachert (who lately read a paper on the subject before the Westphalian Architects' Society) that the real reason of its destruction was its shaky condition and the hindrance it formed to the navigation of the Rhine.

PRICES CURRENT OF MATERIALS.

TIMBER.	£.	s.	d.	£.	s.	d.
Greenheart, B.G. ....ton	6	5	0	7	0	0
Teak, E.I. ....load	11	0	0	15	0	0
Sequoia, U.S. ....foot cube	0	2	4	0	2	9
Ash, Canada ....load	3	0	0	4	10	0
Birch ,, ...	2	10	0	4	0	0
Elm ,, ...	3	10	0	4	10	0
Fir, Dantsic, &c.	1	10	0	4	0	0
Oak ,, ...	2	10	0	5	0	0
Canada	4	0	0	6	10	0
Pine, Canada red	2	10	0	4	0	0
,, yellow	3	0	0	5	0	0
Lath, Dantsic ....fathom	3	10	0	5	0	0
St. Petersburg	4	0	0	6	0	0
Wainscot, Riga....log	2	15	0	4	10	0
,, Odessa, crown	3	7	6	0	0	0
Deals, Finland, 2nd and 1st...std. 100	7	0	0	8	0	0
,, 4th and 3rd	6	0	0	7	0	0
Riga	6	0	0	7	0	0
St. Petersburg, 1st yellow	8	0	0	14	0	0
,, 2nd ,, ...	7	0	0	8	0	0
,, white	7	0	0	10	0	0
Deals, Swedish	6	0	0	15	0	0
White Sea	7	0	0	17	10	0
Canada Pine, 1st	17	0	0	30	0	0
,, 2nd	12	0	0	17	0	0
,, 3rd, &c.	6	0	0	10	0	0
,, Spruce 1st	8	0	0	11	0	0
,, 3rd and 2nd	5	0	0	7	10	0
New Brunswick, &c....	5	0	0	7	0	0
Battens, all kinds	4	0	0	12	0	0
Flooring Boards, sq. 1 in., Prepared, first	0	9	0	0	13	0
Second	0	7	6	0	8	6
Other qualities	0	5	0	0	7	0
Cedar, Cuba....foot	0	0	3½	0	0	4
Honduras, &c.	0	0	2½	0	0	4
Australian	0	0	2	0	0	3
Mahogany, Cuba	0	0	5	0	0	7½
St. Domingo, cargo average	0	0	5	0	0	7½
Mexican ,, ...	0	0	3½	0	0	4½
Tobasco ,, ...	0	0	4	0	0	6½
Honduras ,, ...	0	0	4½	0	0	6½
Maple, Bird's-eye....	0	0	6	0	0	8
Rose, Rio ....ton	7	0	0	10	0	0
Bahia....	6	0	0	10	0	0
Box, Turkey	5	0	0	17	0	0
Satin, St. Domingo ....foot	0	0	7	0	0	11
Porto Rico	0	0	8	0	1	3
Walnut, Italian	0	0	4	0	0	5
METALS.						
IRON—Pig, in Scotland ....ton	0	0	0	0	0	0
Bar, Welsh, in London....	4	10	0	4	17	6
,, ,, in Wales	4	5	0	4	10	0
,, Staffordshire, London	5	5	0	6	10	0
Sheets, single, in London....	6	15	0	8	10	0
Hoops ,, ...	6	0	0	7	0	0
Nail-rods ,, ...	5	10	0	6	10	0
COPPER—						
British, cake and ingot ....ton	42	0	0	43	0	0
Best selected	43	0	0	44	0	0
Sheets, strong....	49	0	0	50	0	0
,, India	46	0	0	47	0	0
Australian	0	0	0	0	0	0
Chili, bars	39	10	0	39	17	6
YELLOW METAL....lb.	0	0	4½	0	0	4½
LEAD—Pig, Spanish	13	2	6	13	3	9
English, common brands....	13	12	6	0	0	0
Sheet, English	14	2	6	14	5	0
SPELTER—						
Silesian, special ....ton	14	2	6	14	5	0
Ordinary brands	14	0	0	0	0	0
TIN—						
Banca ....ton	0	0	0	0	0	0
Billiton	0	0	0	0	0	0
Straits	100	0	0	0	0	0
Australian	100	10	0	0	0	0
English ingots....	104	0	0	0	0	0
ZINC—						
English sheet ....ton	18	0	0	18	5	0
OILS.						
Linseed ....ton	21	5	0	21	10	0
Cocoanut, Cochin	32	10	0	32	15	0
Ceylon	26	5	0	0	0	0
Copra....	0	0	0	0	0	0
Palm, Lagos	24	0	0	0	0	0
Palm-nut Kernel	0	0	0	0	0	0
Rapeseed, English pale....	22	10	0	0	0	0
,, brown	21	0	0	0	0	0
Cottonseed, refined	18	0	0	18	15	0
Tallow and Oleine	25	0	0	45	0	0
Lubricating, U.S.	6	0	0	10	0	0
,, Refined	8	0	0	13	0	0
TURPENTINE—						
American, in casks....cwt.	1	4	0	0	0	0
TAR—Stockholm ....barrel	0	17	0	0	17	6
Archangel....	0	10	6	0	11	3

COMPETITIONS, CONTRACTS, & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom required.	Premium.	Designs to be delivered.	Page.
Rebuilding Workhouse	Elham Union	21*l.*	August 30th	ii.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Enlargement of Schools	School Brd for London	*Official*	July 13th	ii.
Kerbing, Tar-paving, Metalling, &c., Works	Lewisham Board of Wks	do.	do.	ii.
Repairing and Painting Works	Lambeth Guardians	do.	July 14th	ii.
Cast-Iron Lamp Posts	Hackney Board of Wks.	J. Lovegrove	do.	xiii.
Broken and Unbroken Stone	Hull Corporation	J. Fox Sharpe	July 15th	ii.
Paving	St. George-in-the-East Vestry	*Official*	do.	ii.
Painting and Repairing	Poplar Poor Law Union	Hills & Fletcher	do.	ii.
Erection of House, Hampstead	Midland Railway Co.	A. A. Langley	do.	ii.
Erection of Business Premises, Cardiff	D. Duncan & Sons	S. Rooney	do.	xiii.
Repairing, Cleansing, and Painting Schools	School Brd for London	*Official*	July 16th	ii.
Timber Supply	Dir. of Army Contracts	do.	do.	ii.
Reservoir, &c., Oswestry	Liverpool Corporation	G. F. Deacon	July 19th	ii.
Construction of Sewers	Acton Local Board	C. N. Lailey	July 20th	ii.
Iron Hurdle Fencing	Lincolnshire Co. Asylm	F. H. Goddard	do.	ii.
Tar Paving	Epsom Local Board	*Official*	do.	xiii.
Raising Portion of River Wall	Greenwich Bd. of Wks.	do.	July 21st	xiii.
Pipe-Sewers, &c.	do.	do.	do.	xiii.
Painting, &c., Parkhurst (Isle of Wight)	War Department	do.	do.	ii.
Well Sinking	Newport Pagnell R.S.A.	G. W. Branson	do.	xiii.
Brick Sewers, &c.	St. Marylebone Vestry	*Official*	July 22nd	xiii.
Erection of Shed	Rochestr, &c., Gaslgt C.	do.	do.	ii.
Stone (Flags, Kerb, and Edging)	Malton U. S. A.	T. L. Webster	July 24th	xiii.
Drainage, &c., Darenth Asylum	Met. Asylums Board	A. & C. Harston	July 26th	ii.
New Post-Office, Aldershot	Com. of H.M. Works	*Official*	July 27th	ii.
Town-hall, Municipal Offices, &c.	Dewsbury Corporation	H. Holtom	do.	ii.
Erection of Infirmary	Barnet Union	T. Ladds	July 28th	ii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
Superintending Architect	Met. Board of Works	1,500*l.*	July 14th	xvi.
Surveyor and Sanitary Inspector	Henley-on-Thames Cor.	130*l.*	July 19th	xvi.

TENDERS.

BETHNAL-GREEN.—For alterations at the Cambridge Arms, Bethnal-green, for Mr. F. Garner. Mr. Edward Brown, surveyor, 18, Hanbury-street, Spitalfields:—

Marr	£270 0 0
Hawkings	211 0 0
Buckle	200 0 0

BRISTOL.—For building party-wall at 69, Victoria-street, Bristol, for Messrs. Price & Titley. Messrs. J. W. Trew & Sons, architects, Broad-street, Bristol. Quantities not supplied:—

Thos. Penny (masonry only)	£114 0 0
Wm. Norris	81 17 6
E. C. Howell & Son	78 0 0
Enos Gay (accepted)	68 0 0

[All of Bristol.]

CARDIFF.—For the erection of Calvinistic Methodist Mission Hall, Cardiff. Mr. J. H. Phillips, architect, Cardiff:—

C. Gray	£1,137 0 0
D. Thomas (accepted)	924 0 0

CREWKERNE (Somerset).—For a factory at Crewkerne, Somerset, for Mr. John Henry Walter. Mr. Henry Hall, architect, Doughty-street:—

Wheeler & Gregory, Radstock	£2,160 0 0
Draper, Crewkerne	1,921 5 5
Howell & Son, Bristol	1,875 0 0
Trevena, Plymouth	1,829 0 0
Paull, Merriott	1,825 1 11
Cox, Yeovil	1,824 6 0
Poole, Ilminster	1,823 0 0
Davis & Son, Dorchester	1,775 7 11
Gibson, Exeter	1,760 0 0
S. & J. Staple, Stoke-under-Ham	1,736 0 0
Symes, Combe St. Nicholas	1,718 0 0
Hann, Stoke Abbott	1,655 0 0
Pitman & Rowsell, Stoke-under-Ham	1,525 10 0
Lye & Son, Crewkerne	1,490 0 0
Mumford, Crewkerne	1,480 0 0

HOLLINGBOURNE (Kent).—For hospital for infectious diseases, for Hollingbourne Union. Mr. Hubert Bensted, F.R.I.B.A., architect:—

Wallis & Clements, Maidstone	£2,127 0 0
Reeves, Staplehurst	2,097 0 0
Marley, Detling	2,093 0 0
Barden, Maidstone	1,973 0 0
Avard, Maidstone (accepted)	1,830 0 0

ISLINGTON.—For proposed alterations, &c., to the Pied Bull public-house, No. 1, Liverpool-road, for Messrs. Tomalin & Anstiss. Quantities supplied. Messrs. Bird & Walters, architects:—

Patman & Fotheringham	£735 0 0
Langridge & Son	721 0 0
Goad	670 0 0
Burch & Co.	659 0 0
Vears & Co.	655 0 0
Jackson & Todd	610 0 0
John Anley	607 0 0

KENSINGTON.—For additions to 1, Redcliffe-square, for Miss Armitage. Mr. Henry W. Braddock, architect:—

Lidstone, Finsbury Park (accepted)	£375 0 0

LODDON (Norfolk).—For additions and alterations to Police Station, Loddon, for the Magistrates of the county of Norfolk. Mr. T. H. B. Heslop, A.M. Inst. C.E., County Surveyor, Norwich:—

Chaston & Grimson, Loddon	£240 0 0
G. E. Hawes, Norwich	230 0 0
Horace Lacey, Norwich (accepted)	173 0 0

LONDON.—For new staircase at Congregational Memorial Hall, Farringdon-street. Mr. W. D. Church, architect, South-place, Finsbury. Quantities by Mr. C. Stanger, Finsbury-pavement:—

Jas. Holloway, Marmion Works, Lavender-hill, S.W.	£989 0 0

LONDON.—For fitting up premises, Tottenham-court-road, as a Branch Bank for the Central Bank of London (Limited). Messrs. Hammack & Lambert, architects:—

Jones & Hoppers	£1,741 0 0
Colls & Sons	1,668 0 0
J. H. Johnson	1,615 0 0
Brass & Son	1,597 0 0
T. L. Green	1,585 0 0
G. Colls	1,335 0 0
Heating.	
Stannah	£70 10 0

LONDON.—General repairs, &c., to Norfolk House, Albert-road, Regent's Park, for Mr. G. Heigham. Mr. James Lawes, architect:—

Coles	£102 15 8
Vears & Co.	79 0 0
Allard	75 0 0

LONDON.—For rebuilding the New Inn, Tottenham-court-road, for Messrs. Cakebread. Mr. W. T. Farthing, architect:—

H. Pickersgill & Co.	£2,893 0 0
E. Lawrance & Sons	2,875 0 0
J. & J. Greenwood	2,798 0 0
B. Cook (too late)	2,795 0 0
T. L. Green	2,789 0 0
S. R. Lamble	2,765 0 0
W. Scrivener & Co.	2,714 0 0
R. Marr	2,667 0 0
Spencer & Co.	2,640 0 0
Jackson & Todd	2,593 0 0
Leslie & Knight (accepted)	2,548 0 0

LONDON.—For the erection of new granaries and lofts at the premises of the London Road Car Company, No. 9, Grosvenor-road, Pimlico. Mr. H. J. Newton, architect, Queen Anne's Gate:—

Burman & Sons	£1,197 0 0
Godden	1,195 0 0
Walker	1,170 0 0
Chafen	1,160 0 0
Lordon	1,119 0 0
Smith, Pont-street (accepted)	845 0 0

LONDON.—For painting, cleansing, and repairing schools, Mina-road, Old Kent-road, for the School Board for London:—

Howell & Son	£580 0 0
Knight & Walden	486 0 0
C. A. Mackrell & Co., East Dulwich	399 0 0
Holloway	335 0 0

LUDDENDEN.—For two houses, outbuildings, and boundary-walls, Luddenden. Wall-stones and ashlar found by proprietor. Mr. T. L. Patchett, architect, Halifax:—

Accepted Contractors.

Excavator, Mason, and Bricklayer's Work.—J. & W. H. Fletcher, Luddenden.

Carpenter and Joiner's Work.—Edwin Marsland, Booth.

Plumber and Glazier's Work.—Jonas Alderson, Luddenden Foot.

Plasterer and Slater's Work.—J. & T. Alderson, Luddenden.

[Total cost, 375*l.*]

LYMINGTON (Hants).—For the erection of an infants' school to accommodate 250 children. Mr. Horne, Town Surveyor, architect:—

J. Pearce	£1,245 0 0
F. Reeks	813 0 0
Rushley Bros. (accepted)	795 0 0

[All of Lymington.]

PECKHAM.—For painting, cleansing, and repairing schools in Cator-street, Peckham, for the School Board for London:—

D. McNeil	£728 0 0
E. C. Howell & Son	650 0 0
C. A. Mackrell & Co., East Dulwich	494 0 0
Johnson	448 0 0
Parker	445 0 0
Knight & Walden	402 0 0
Holloway	366 0 0

PLUMSTEAD (Kent).—For three houses in Herbert-road, and two houses in Ripon-road, Plumstead, Kent, for Mr. J. Glock. Mr. Henry H. Church, architect, Woolwich:—

Johnson	£2,750 0 0
Coombs	2,625 0 0
Fenn	2,470 0 0
Lonergan Bros.	2,465 0 0
Covil	2,370 0 0

GOLD AND SILVER MEDALS AT AMSTERDAM EXHIBITION.

IRON CISTERNS.

F. BRABY & CO.

LONDON, LIVERPOOL, GLASGOW.

VERY PROMPT SUPPLY.

LARGE STOCK READY.

CYLINDERS FOR HOT-WATER CIRCULATION.

Particulars on application.

Chief Office: 360, EUSTON ROAD, LONDON.

SOUTHSEA.—For the erection of a house and gardener's cottage at Hampshire-terrace and Hampshire-street, Southsea, for Miss Dry, of Oxford. Mr. John W. Stroud, architect, Southsea. Quantities by Mr. James W. Stroud, Portsea:—

Jas. Biden	£1,595	0	0
H. Lawrence	1,560	0	0
T. Quick	1,365	0	0
J. H. Corke (accepted)	1,300	0	0

[All of Southsea.]

THORPE (Norwich).—For painting the outside of Auxiliary Lunatic Asylum, Thorpe, Norwich, for the Magistrates of the county of Norfolk. Mr. T. H. B. Heslop, Assoc. M.Inst.C.E., County Surveyor, Norwich:—

W. E. Bird & Son, Norwich*	£125	0	0

* Accepted.

WELSINGTON LAITHES (Kendal).—For the alterations and additions to house. Mr. Jno. Stalker, architect, Kendal:—

Excavating, Walling, Mason's Work, and Slating.

D. Thoms, Kendal	£122	0	0

Carpenter and Joiner's Work.

S. Compstone, Kendal	68	0	0

Plumbing, Glazing, and Painting.

Geo. Lyon, Kendal	29	8	0

WESTMINSTER.—For rebuilding No. 1, James-street (the King's Head), also No. 3, James-street, Buckingham Gate, for Mr. H. A. Savage. Mr. H. Hardwicke Langston, architect, Great James-street, Bedford-row. Quantities supplied:—

Exton	£5,137	0	0
Stimpson & Co.	5,112	0	0
Cox	4,995	0	0
Falkner	4,975	0	0
Nightingale	4,888	0	0
Bush	4,870	0	0
Spencer & Co.	4,849	0	0
Beasley	4,800	0	0
Langmead & Way	4,779	0	0
Harris & Wardrop (accepted)	4,763	0	0
Brown & Co.	4,450	0	0

WHASSET (Westmoreland).—For alterations and additions to two farmsteads, for Mr. Wm. Bindloss, Milnthorpe. Mr. John Stalker, architect, Kendal:—

Excavating, Walling, and Slating.

Brennand & Son, Kendal	£120	0	0

Carpenter and Joiner's Work.

Anthony Nelson, jun., Old Hutton, near Kendal	60	0	0

Plumbing, Glazing, and Painting.

Wm. Jackson, Kendal	20	0	0

Re Warehouses, 58 and 60, Scrutton-street, Curtain-road.—Mr. Jesse Chessum, of Great Eastern-street, writes:—"In your last week's issue you have made a slight error in your list for the above, placing 'Cheeseman' instead of my name as that of the successful tenderer for the above works."

SPECIAL NOTICE.—Lists of Tenders frequently reach us too late for insertion. They should be delivered at our office, 46, Catherine-street, W.C., *not later than Four p.m.* on THURSDAYS.

TO CORRESPONDENTS.

***Registered Telegraphic Address*, "THE BUILDER, LONDON."**

J. B.—C. S. Jun.—H. T.—A. B. (we do not approve of that kind of practice any more than you do).—J. T.—R. B., Paris.—H. H. & Co. (very likely you are right; but the protest does not come so well from another house occupied in the same branch of manufacture).

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; all communications relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

PUBLISHER'S NOTICES.

***Registered Telegraphic Address*, "THE BUILDER, LONDON."**

THE INDEX and TITLE-PAGE for Volume L. (Jan. to June, 1886) will be given as a Supplement with our next Number.

A COLOURED TITLE-PAGE may be had, gratis, on personal application at the Office.

CLOTH CASES for Binding the Numbers are now ready, price 2s. 6d. each; also

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THE FIFTIETH VOLUME of "The Builder" (bound), price Twelve Shillings and Sixpence, will be ready on the 22nd inst.

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DOUGLAS FOURDRINIER, Publisher,
Addressed to No. 46, Catherine-street, W.C.

Advertisements for the current week's issue must reach the Office before THREE o'clock p.m. on THURSDAY.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c. left at the Office in reply to Advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

SPECIAL.—ALTERATIONS in STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same, must reach the Office before TEN o'clock on WEDNESDAY mornings.

PERSONS Advertising in "The Builder," may have *Replies addressed to the Office, 46, Catherine-street, Covent Garden, W.C. free of charge.* Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage.

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied DIRECT from the Office to residents in any part of the United Kingdom at the rate of 19s. per annum PREPAID. To all parts of Europe, America, Australia, and New Zealand, 26s. per annum. To India, China, Ceylon, &c. 30s. per annum. Remittances payable to DOUGLAS FOURDRINIER, Publisher, No. 46, Catherine-street, W.C.

Best Bath Stone.

WESTWOOD GROUND,
Box Ground, Combe Down,
Corsham Down,
And Farleigh Down,
RANDELL, SAUNDERS, & CO., Limited,
Corsham, Wilts. [ADVT.

Bath Stone.

BEST QUALITY OF ALL KINDS.

PICTOR & SONS,
BOX, WILTS. [ADVT.

Doulting Freestone and Ham Hill Stone of best quality, in blocks, or prepared ready for fixing. An inspection of the Doulting Quarries is respectfully solicited; and Architects and others are CAUTIONED against inferior stone. Prices, delivered to any part of the United Kingdom, given on application to CHARLES TRASK & SONS, Norton-sub-Hamdon, Ilminster, Somerset.—Agent, Mr. E. WILLIAMS, No. 16, Craven-street, Strand, W.C. [ADVT.

Doulting Free Stone
HAM HILL STONE,
BLUE LIAS LIME
(Ground or Lump),
For prices, &c., address S. & J. STAPLE, Quarry Owners, Stone and Lime Merchants, Stoke-under-Ham, Ilminster. [ADVT.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 38, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds, and milk-rooms, granaries, tun-rooms, and terraces. [ADVT.

Asphalte.
Seyssel, Patent Metallic Lava, and White Asphaltes.
M. STODART & CO.
Office:
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LEVER, SCREW, & BARREL BOLTS,
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36A, BOROUGH ROAD,
DISCOUNT TO BUILDERS. LONDON, S.E.

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WOOD
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TO SPECIAL DESIGNS
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C. HINDLEY & SONS,
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FOR MAIN SEWERS, &c., from 15 inches to 36 inches diameter.
SOLE MAKERS:
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BOURNE VALLEY WORKS, POOLE, DORSET
London Agents: Messrs. BOWES, SCOTT, & READ, Broadway Chambers, Westminster.

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Drainage, &c., Darenth Asylum	Met. Asylums Board	A. & C. Harston	July 26th	ii.
New Post-Office, Aldershot	Com. of H.M. Works	*Official*	July 27th	ii.
Town-hall, Municipal Offices, &c.	Dewsbury Corporation	H. Holtom	do.	ii.
Erection of Infirmary	Barnet Union	T. Ladds	July 28th	ii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
Superintending Architect	Met. Board of Works	1,500*l.*	July 14th	xvi.
Surveyor and Sanitary Inspector	Henley-on-Thames Cor.	130*l.*	July 19th	xvi.

TENDERS.

BETHNAL-GREEN.—For alterations at the Cambridge Arms, Bethnal-green, for Mr. F. Garner. Mr. Edward Brown, surveyor, 18, Hanbury-street, Spitalfields:—

Marr	£270 0 0
Hawkings	211 0 0
Buckle	200 0 0

BRISTOL.—For building party-wall at 69, Victoria-street, Bristol, for Messrs. Price & Titley. Messrs. J. W. Trew & Sons, architects, Broad-street, Bristol. Quantities not supplied:—

Thos. Penny (masonry only)	£114 0 0
Wm. Norris	81 17 6
E. C. Howell & Son	78 0 0
Enos Gay (accepted)	68 0 0

[All of Bristol.]

CARDIFF.—For the erection of Calvinistic Methodist Mission Hall, Cardiff. Mr. J. H. Phillips, architect, Cardiff:—

C. Gray	£1,137 0 0
D. Thomas (accepted)	924 0 0

CREWKERNE (Somerset).—For a factory at Crewkerne, Somerset, for Mr. John Henry Walter. Mr. Henry Hall, architect, Doughty-street:—

Wheeler & Gregory, Radstock	£2,160 0 0
Draper, Crewkerne	1,921 5 5
Howell & Son, Bristol	1,875 0 0
Trevena, Plymouth	1,829 0 0
Paull, Merriott	1,825 1 11
Cox, Yeovil	1,824 6 0
Poole, Ilminster	1,823 0 0
Davis & Son, Dorchester	1,775 7 11
Gibson, Exeter	1,760 0 0
S. & J. Staple, Stoke-under-Ham	1,736 0 0
Symes, Combe St. Nicholas	1,718 0 0
Hann, Stoke Abbott	1,655 0 0
Pitman & Rowsell, Stoke-under-Ham	1,525 10 0
Lye & Son, Crewkerne	1,490 0 0
Mumford, Crewkerne	1,460 0 0

HOLLINGBOURNE (Kent).—For hospital for infectious diseases, for Hollingbourne Union. Mr. Hubert Bensted, F.R.I.B.A., architect:—

Wallis & Clements, Maidstone	£2,127 0 0
Reeves, Staplehurst	2,097 0 0
Marley, Detling	2,093 0 0
Barden, Maidstone	1,973 0 0
Avard, Maidstone (accepted)	1,830 0 0

ISLINGTON.—For proposed alterations, &c., to the Pied Bull public-house, No. 1, Liverpool-road, for Messrs. Tomalin & Anstiss. Quantities supplied. Messrs. Bird & Walters, architects:—

Patman & Fotheringham	£735 0 0
Langridge & Son	721 0 0
Goad	670 0 0
Burch & Co.	659 0 0
Vears & Co.	655 0 0
Jackson & Todd	610 0 0
John Anley	607 0 0

KENSINGTON.—For additions to 1, Redcliffe-square, for Miss Armitage. Mr. Henry W. Braddock, architect:—

Lidstone, Finsbury Park (accepted)	£375 0 0

LODDON (Norfolk).—For additions and alterations to Police Station, Loddon, for the Magistrates of the county of Norfolk. Mr. T. H. B. Heslop, A.M. Inst. C.E., County Surveyor, Norwich:—

Chaston & Grimson, Loddon	£240 0 0
G. E. Hawes, Norwich	230 0 0
Horace Lacey, Norwich (accepted)	173 0 0

LONDON.—For new staircase at Congregational Memorial Hall, Farringdon-street. Mr. W. D. Church, architect, South-place, Finsbury. Quantities by Mr. C. Stanger, Finsbury-pavement:—

Jas. Holloway, Marmion Works, Lavender-hill, S.W.	£989 0 0

LONDON.—For fitting up premises, Tottenham-court-road, as a Branch Bank for the Central Bank of London (Limited). Messrs. Hammack & Lambert, architects:—

Jones & Hoppers	£1,741 0 0
Colls & Sons	1,668 0 0
J. H. Johnson	1,615 0 0
Brass & Son	1,597 0 0
T. L. Green	1,585 0 0
G. Colls	1,335 0 0
Heating.	
Stannah	£70 10 0

LONDON.—General repairs, &c., to Norfolk House, Albert-road, Regent's Park, for Mr. G. Heigham. Mr. James Lawes, architect:—

Coles	£102 15 8
Vears & Co.	79 0 0
Allard	75 0 0

LONDON.—For rebuilding the New Inn, Tottenham-court-road, for Messrs. Cakebread. Mr. W. T. Farthing, architect:—

H. Pickersgill & Co.	£2,893 0 0
E. Lawrance & Sons	2,875 0 0
J. & J. Greenwood	2,798 0 0
B. Cook (too late)	2,795 0 0
T. L. Green	2,789 0 0
S. R. Lamble	2,765 0 0
W. Scrivener & Co.	2,714 0 0
R. Marr	2,667 0 0
Spencer & Co.	2,640 0 0
Jackson & Todd	2,593 0 0
Leslie & Knight (accepted)	2,548 0 0

LONDON.—For the erection of new granaries and lofts at the premises of the London Road Car Company, No. 9, Grosvenor-road, Pimlico. Mr. H. J. Newton, architect, Queen Anne's Gate:—

Burman & Sons	£1,197 0 0
Godden	1,195 0 0
Walker	1,170 0 0
Chafen	1,160 0 0
Lordon	1,119 0 0
Smith, Pont-street (accepted)	845 0 0

LONDON.—For painting, cleansing, and repairing schools, Mina-road, Old Kent-road, for the School Board for London:—

Howell & Son	£560 0 0
Knight & Walden	486 0 0
C. A. Mackrell & Co., East Dulwich	399 0 0
Holloway	335 0 0

LUDDENDEN.—For two houses, outbuildings, and boundary-walls, Luddenden. Wall-stones and ashlar found by proprietor. Mr. T. L. Patchett, architect, Halifax:—

Accepted Contractors.

Excavator, Mason, and Bricklayer's Work.—J. & W. H. Fletcher, Luddenden.

Carpenter and Joiner's Work.—Edwin Marsland, Booth.

Plumber and Glazier's Work.—Jonas Alderson, Luddenden Foot.

Plasterer and Slater's Work.—J. & T. Alderson, Luddenden.

[Total cost, 375*l.*]

LYMINGTON (Hants).—For the erection of an infants' school to accommodate 250 children. Mr. Horne, Town Surveyor, architect:—

J. Pearce	£1,245 0 0
F. Reeks	813 0 0
Rushley Bros. (accepted)	795 0 0

[All of Lymington.]

PECKHAM.—For painting, cleansing, and repairing schools in Cator-street, Peckham, for the School Board for London:—

D. McNeil	£728 0 0
E. C. Howell & Son	650 0 0
C. A. Mackrell & Co., East Dulwich	464 0 0
Johnson	448 0 0
Parker	445 0 0
Knight & Walden	402 0 0
Holloway	366 0 0

PLUMSTEAD (Kent).—For three houses in Herbert-road, and two houses in Ripon-road, Plumstead, Kent, for Mr. J. Glock. Mr. Henry H. Church, architect, Woolwich:—

Johnson	£2,750 0 0
Coombs	2,625 0 0
Fenn	2,470 0 0
Lonergan Bros.	2,465 0 0
Covil	2,370 0 0

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